THE CITY OF KEY WEST
3140 Flagler St,
Key West, Florida 330-40

ADDENDUM #1
Repairs to Navy Mole Bulkhead 497
Invitation to Bid: 12-007
9 February 2012

This Addendum is issued as supplemental information to the bid package for clarification of certain matters of both a general and a technical nature. The referenced bid package is amended in accordance with the following items:

1. Construction Budget Estimate: $1.5 to $2.5 million dollars
2. Attached is Section 00-72-00 General Conditions and are a part of this contract
3. The following "Attachment A: Construction Compliance with Specifications and Plans" is a part of the Supplementary Conditions
4. The following "Attachment B: NAS Rapid Gate Information" is a part of the Supplementary Conditions
5. The Buy American Act FAR 52.225 is a part of this contract
6. Noise levels shall be kept to a minimum while a Cruise ship is at dock. At other times noise levels shall follow the City of Key West Sound Control Ordinance Section 26-191 to 26-196. The ordinance in general allows for construction/demolition sound levels produced from tools and equipment in commercial construction, demolition, drilling, or reasonably similar activities. However, such sound levels are limited to the hours of 8:00 a.m. to 7:00 p.m., Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturday. The tools and equipment must be muffled and maintained equal to the functional standards of the industry. No exceptions contained in this subsection shall apply on Thanksgiving Day, Christmas Day and New Year's Day.
7. Prevailing wage rates do not apply to this project.
8. Question: What environmental concerns exist regarding drill-cuttings or grout overflow from the anchor holes? Please define what must be done to contain drill spoils and grout during the work? Answer: Environmental permits require all activities associated with this work be conducted in a manner which does not cause violations of state water quality standards. The standards can be found at http://www.dep.state.fl.us/legal/rules/shared/62-302/62-302.pdf. The surface water at the project site are Class III Marine. The contractor shall implement best management practices for erosion and pollution control to prevent violations of state water quality standards. Turbidity barriers shall be installed and maintained at all locations where the possibility of transferring suspended solids into the receiving water-body exists due to the work.
9. Second Optional Site Visit: A second optional site visit has been set for 24 February at 10am at the entrance gate to the Mole Pier

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

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This document has been approved and endorsed by

The Associated General Contractors of America

Knowledge for Creating and Sustaining the Built Environment

Construction Specifications Institute

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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*--The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*--The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*--A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*-- Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*--The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*--The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*--See Paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*--The individual or entity named as such in the Agreement.

20. *Field Order*--A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

22. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

23. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*--The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*--A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*--The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*--Polychlorinated biphenyls.

31. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*--A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Related Entity* -- An officer, director, partner, employee, agent, consultant, or subcontractor.

37. *Resident Project Representative*--The authorized representative of Engineer who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Schedule of Submittals*--A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

40. *Schedule of Values*--A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

41. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

42. *Site*--Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and

easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

43. *Specifications*--That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

44. *Subcontractor*--An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

45. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.

46. *Successful Bidder*--The Bidder submitting a responsive Bid to whom Owner makes an award.

47. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

48. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

49. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. *Unit Price Work*--Work to be paid for on the basis of unit prices.

51. *Work*--The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

52. *Work Change Directive*--A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. *Intent of Certain Terms or Adjectives*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered”, “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents, or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 30 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review**:**

1. a preliminary Progress Schedule; indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of, their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor

shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing all of the Work under a direct or indirect contract with Contractor, shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or

2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

B. The prohibition of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, and/or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous

Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06. G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

5.04 *Contractor's Liability Insurance*

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insured (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to

the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, (other than caused by flood) and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct

physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order .

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary

circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;

b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified , and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change,

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed 21 days within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or-equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to the Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom the Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued . No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer,, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of

or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be maintained on site and available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or , or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor’s duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances and whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among

employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. Shop Drawings

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:* Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals.

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any [illegible]able to bo[illegible]ry to or des[illegible] Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

See City of Key West Indemnification form under Section 00-43-18

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or

anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 - OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 *Insurance*

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the

performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to, the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time

to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim, shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,

2. approve the Claim, or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expresses, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract

Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will

be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but

not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefore as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action,

Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. Applications for Payments

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under

Paragraph 9.07, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;

b. consent of the surety, if any, to final payment;

c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and , will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or

2. agrees with the other party to submit the Claim to another dispute resolution process, or

3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

ATTACHMENT A
CITY OF KEY WEST

Certification of Construction Compliance with Specifications and Plans

Project Number _____

Date _____

PO Number _____

Monthly ☐

Final ☐

Project Name _____

Prime Contractor for the above referenced contract hereby verifies based on personnel knowledge or reasonable investigation and good faith belief, all Quality Control functions and Quality Control sampling and test results are in substantial compliance with the pertinent specification requirements for this project The represents work completed between _____ and _____. Exceptions are listed below.

(add addition sheets as required)
Item No.
Exception:

A false statement or omission made in connection with this certification is sufficient cause for suspension, revocation, or denial of qualification to bid, and a determination of non-responsibility, and may subject the person and /or entity making the false statement to any civil and criminal penalties available pursuant to applicable State and Federal Law.

Contractor:_____ Date:_____

State of Florida
County of:

Sworn to and subscribed before me this _____ day

of _____,_____

By_____
(print name of person signing certification)

Notary Public

Commission Expires

*RAPID*Gate Company Enrollment Form

Thank you for enrolling in the *RAPID*Gate® Program. Please follow these instructions:

1. Complete the Enrollment Information (Part A).
2. Carefully read and sign the *RAPID*Gate User Agreement: Companies (Part B).
3. Fax the entire form to 503-924-5320, attention *RAPID*Gate Customer Service.
4. If you have any questions, please call 1-877-*RAPID*Gate (1-877-727-4342).

Part A: Enrollment Information

The following information is required and must be completed by an authorized representative of your company.

At which installation is your company enrolling? NAVAL AIR STATION, KEY WEST, FL
Does your company require 24x7 access to the installation? ☐ Yes ☐ No
Are you enrolled in the *RAPID*Gate Program at another installation? ☐ Yes ☐ No
If yes, list the installation(s) at which you are enrolled:

Your Company Information

Company Name:		
Website Address:		
Phone:	**Fax**:	
Billing Address:		
City:	**State**:	**Zip Code**:
Country:		

Tenant Sponsor Information (This is a government agent at the installation that can verify your company's legitimate business).

Sponsor Organization (i.e. Commissary, Security Office, Hospital, AAFES):
Sponsor's Name:
Sponsor's Title:
Sponsor's Email:
Sponsor's Phone:
Contract No.: **Expiration Date**:

Billing Information

Company Enrollment Fee*: $199 **Employee Registration Fee*:** $159
*The fees to enroll in Multi-Facility is at a discounted rate. Contact *RAPID*Gate Customer Service at 1-877-727-4342 to find out about the rates. Eid Passport, Inc. reserves the right to change the *RAPID*Gate Program fees at its sole discretion.
Payment Method (Please Select): Visa☐ MasterCard ☐ Discover ☐ AMEX ☐ Check* ☐ Electronic Check* (Fill out bottom of page 3.) ☐
If Credit Card: Cardholder's Name:
Credit Card Number:
Security Code (3 or 4 digits):
Credit Card Expiration: **Month**: **Year**:
Credit Card Holder's Billing Address:
City: **State**: **Zip Code**:
Expected Number of Employee Registrations:
Please list the names of authorized participating employees names here only if you want the registration fees billed to the form of payment selected above. Do not list the employees' personal information. Attach an additional page for more than 10 authorized employees.
1. SEE ATTACHED LIST
2.
3.
4.
5.
6.
7.
8.
9.
10.
Please initial the appropriate box: ☐ I authorize payment to enroll my company and to register the number of employees with the form of payment cited above. ☐ I authorize payment to enroll my company with the form of payment listed above.
* Checks should be made payable to **Eid Passport, Inc**. Please mail to: Eid Passport, Inc. 10450 SW Nimbus Avenue, Bldg R-A Portland, OR 97223 Attention: Accounts Receivable

Representative from Your Company in Charge of *RAPID*Gate Administration ("*RAPID*Gate Company Administrator")

Name:	**Email**:
Title:	
Phone:	**Fax**:

Individual Enrolling Company

Check here ☐ if this individual can be a second point of contact for the *RAPID*Gate Program. (This person will have the same authorities as the person listed above).

Name:	**Email**:
Title:	
Phone:	**Fax**:

Electronic Check Authorization (Only applicable if you are paying by electronic check).

Name as appears on Check**:**
Account Number**:**
Routing Number**:**
Check Number**:**
Authorized Debit Amount:

Signature_____ Date_____

I acknowledge that the origination of ACH transactions to my account must comply with the provisions of U.S. law. I agree to notify merchant in writing of any changes in my account information or termination of this authorization 15 days prior to the due date of the charges. I understand that cancellations must be made in writing and I will not dispute merchant debiting my checking/savings account, so long as the amount corresponds to the terms indicated in this contract.

B. *RAPID*Gate USER AGREEMENT: COMPANIES

Terms and Conditions of Your Company's Enrollment, and Renewal of Enrollment, in Eid Passport, Inc.'s *RAPID*Gate® Program.

Please carefully read the following terms and conditions of this *RAPID*Gate User Agreement ("Agreement"). It is a legally binding contract and affects your company's legal rights.

By signing this Agreement below, and in consideration of the mutual covenants, terms and conditions described in this Agreement, you (1) certify that you have the authority to bind your company to the terms and conditions of this Agreement; (2) accept, on behalf of your company, the terms and conditions of this Agreement; and (3) agree, on behalf of your company, to be bound by the terms and conditions of this Agreement.

Eid Passport, Inc. ("Eid Passport") enters into this Agreement with your company on behalf of itself and on behalf of its related companies, subsidiaries, affiliates and successors.

1. Definitions

For purposes of this Agreement, the following definitions apply:

"Applicant" is an individual who has registered to become an authorized *RAPID*Gate badgeholder.

"Authorized *RAPID*Gate badgeholder" is an individual who has passed a *RAPID*Gate background screening, meets all other *RAPID*Gate program eligibility requirements, and has been issued a *RAPID*Gate badge, thereby entitling the individual to the *RAPID*Gate program access privileges at participating facilities.

"Background screening" and "background screenings" refer to a process by which *RAPID*Gate applicants and authorized *RAPID*Gate badgeholders consent to ongoing review of certain information relating to their background, to determine whether they meet the *RAPID*Gate program's eligibility requirements.

"Company" refers to the company, department or entity that enrolls in the *RAPID*Gate program.

"Enroll" is the procedure by which a company seeks and obtains authorization for its employees to register for the *RAPID*Gate program.

"Fail" refers to a background screening result by which an individual is determined to NOT meet the *RAPID*Gate background screening criteria, and which disqualifies the individual from being an authorized *RAPID*Gate badgeholder.

"Participating facility" is any military or other governmental base, installation, department, organization, building, unit, site or other location that offers *RAPID*Gate access privileges to authorized *RAPID*Gate badgeholders.

"Pass" refers to a background screening result by which an individual is determined to meet the *RAPID*Gate background screening criteria, and which qualifies the individual to be an authorized *RAPID*Gate badgeholder if the individual meets all *RAPID*Gate program eligibility requirements.

"*RAPID*Gate badge" is a credential that is issued to authorized *RAPID*Gate badgeholders. Depending upon the participating facility, the *RAPID*Gate badge may be issued either by Eid Passport or by the United States government, and may contain Radio Frequency Identification ("RFID") or other identifying technology.

"*RAPID*Gate Company Administrator" is an employee of a company that is enrolled in the *RAPID*Gate program, whom the company assigns to be in charge of the company's internal *RAPID*Gate administration.

"Register" is the procedure by which an applicant initiates the process to become an authorized *RAPID*Gate badgeholder.

2. *RAPID*Gate Program Introduction

Welcome to Eid Passport's *RAPID*Gate program! The *RAPID*Gate program has been developed to enhance access security at participating United States military and other government facilities. It also is designed to improve on-site access for eligible companies and their employees who conduct official business on such facilities on a recurring basis.

The enrollment process is simple. First, your company must receive approval from a participating facility to enroll in the *RAPID*Gate program. Next, your company completes all required enrollment documentation and pays the *RAPID*Gate enrollment fee. Eid Passport then validates your company's eligibility to enroll in the *RAPID*Gate program. Upon enrollment, your company provides *RAPID*Gate Customer Service with a list of approved employees and pays for their

*RAPID*Gate registrations. Those employees may then register for the *RAPID*Gate program at the *RAPID*Gate Registration Station located at the participating facility(ies) for which your company is enrolled.

Eid Passport will carefully screen each individual who registers for the *RAPID*Gate program. As part of the registration process, each applicant must pass a confidential *RAPID*Gate background screening. Each applicant who passes the background screening and who meets all other *RAPID*Gate program eligibility requirements will be issued a *RAPID*Gate badge to wear for entrance onto participating facilities. The *RAPID*Gate badge is part of an integrated solution that lets the participating facility know that the individual is an authorized *RAPID*Gate badgeholder who meets the *RAPID*Gate program eligibility requirements for access to the facility. Depending upon the participating facility, the *RAPID*Gate badge may contain RFID or other identifying technology to record when the *RAPID*Gate badgeholder arrives at and departs a participating facility, and to track the *RAPID*Gate badgeholder's whereabouts while on-site at the participating facility.

Your company's *RAPID*Gate enrollment, and its authorized *RAPID*Gate badgeholders' access privileges, are valid for a set period of time as determined by the participating facility, provided that your company and its authorized *RAPID*Gate badgeholders continue to meet the *RAPID*Gate program eligibility requirements at all times. Eid Passport may conduct periodic background screenings of your company's authorized *RAPID*Gate badgeholders on a regular basis, to verify their continued eligibility. Renewals in the *RAPID*Gate program are subject to your company's, and its authorized *RAPID*Gate badgeholders', continued eligibility.

Some participating facilities maintain the *RAPID*Gate program as an optional service. Such facilities do not require companies or their employees to join the *RAPID*Gate program; employees who are not authorized *RAPID*Gate badgeholders continue to have access privileges to the participating facility pursuant to the facility's usual entry requirements and procedures. At other participating facilities, employees will not be allowed to enter the participating facility unless they are authorized *RAPID*Gate badgeholders. Please check with *RAPID*Gate Customer Service or the participating facility for details.

3. The *RAPID*Gate Program is NOT a Pre-Employment or Employee Screening Service

The *RAPID*Gate program is not a pre-employment or employee screening service. Eid Passport conducts background screenings of your company's employees solely for the purpose of determining their eligibility to be authorized *RAPID*Gate badgeholders. Your company may not use the *RAPID*Gate program, including the *RAPID*Gate background screenings, for pre-employment or employment-related purposes.

BY SIGNING THIS AGREEMENT BELOW, YOU AGREE, ON BEHALF OF YOUR COMPANY, THAT YOUR COMPANY WILL NOT USE THE *RAPID*Gate PROGRAM, INCLUDING THE *RAPID*Gate BACKGROUND SCREENINGS, FOR ANY PRE-EMPLOYMENT OR EMPLOYMENT-RELATED PURPOSES. YOU FURTHER AGREE, ON BEHALF OF YOUR COMPANY, THAT YOUR COMPANY WILL DEFEND, INDEMNIFY AND HOLD HARMLESS EID PASSPORT, ITS RELATED COMPANIES, OFFICERS, DIRECTORS, EMPLOYEES, AGENTS, SUBSIDIARIES OR AFFILIATES, AND ANY AGENCY OF THE UNITED STATES GOVERNMENT, FOR AND OF ANY CLAIMS, DEMANDS, OR CAUSES OF ACTION MADE AGAINST EID PASSPORT OR ANY AGENCY OF THE UNITED STATES GOVERNMENT ARISING FROM ANY PRE-EMPLOYMENT OR EMPLOYMENT-RELATED ACTION TAKEN BY YOUR COMPANY AGAINST ANY INDIVIDUAL, RELATING IN ANY WAY TO OR ARISING IN ANY WAY FROM THE *RAPID*Gate PROGRAM.

4. Confidential Background Screenings (Required)

Eid Passport takes seriously its commitment to security. That is why Eid Passport restricts its *RAPID*Gate program to companies and their employees who, at all times, meet all *RAPID*Gate program eligibility requirements including the *RAPID*Gate background screening criteria established for participating facilities.

To register for the *RAPID*Gate program and to become an authorized *RAPID*Gate badgeholder, your company's employees must consent to undergo, and must pass, a background screening to verify their eligibility. Additional background screenings may be conducted on authorized *RAPID*Gate badgeholders at any time or times, to verify their continued eligibility. By registering with the *RAPID*Gate program, the employees consent to such background screenings.

Background screenings will be conducted on individuals under circumstances that may include but are not limited to the following:

- When they first register for the *RAPID*Gate program
- Periodically and at any time or times while they are authorized *RAPID*Gate badgeholders
- When your company renews its employees' *RAPID*Gate badges
- At any time upon request by the participating facility(ies) for which the employees are authorized *RAPID*Gate badgeholders
- At any time upon request by any governmental department or agency that issues *RAPID*Gate badges (see Section 5, below)
- At any time, in Eid Passport's sole discretion, to verify that authorized *RAPID*Gate badgeholders meet the *RAPID*Gate program's eligibility requirements

ANY EMPLOYEE WHO DOES NOT CONSENT TO UNDERGO THE *RAPID*Gate BACKGROUND SCREENINGS, IS INELIGIBLE TO BE AN AUTHORIZED *RAPID*Gate BADGEHOLDER.

Eid Passport contracts with one or more third-party background screening providers to conduct *RAPID*Gate background screenings. The data obtained during the registration process and/or through the background screenings may vary by participating facility and may include any or all of the following:

Individual Information:

- Name
- Social Security Number
- Company-issued Employee Identification Number
- Individual photo
- Date of birth
- Fingerprints
- Address
- Phone number
- Social Security Number verification
- Felony and misdemeanor convictions
- Outstanding warrants
- Sexual offender convictions
- Terrorist or OFAC watch lists
- Driver's license (including all information and images stored on the license)

Public records may be used in the background screening reports, such as civil and/or criminal records. Your company's employees have the right to dispute the information on the report and to request additional disclosures provided under section 606(b) of the Fair Credit Reporting Act ("FCRA"), and a written summary of the employee's rights pursuant to section 609(c) of the FCRA.

If any background screenings produces a "fail" result, Eid Passport and/or its third-party background screening providers will so notify the affected employee. Eid Passport also may notify your company, and possibly also the participating facility(ies), of the employee's "fail" result. In the event of a "fail" result, the employee, and only the employee, will be provided with a copy of his or her background screening report. The employee will be afforded an opportunity to dispute the information in it. If the employee does not timely dispute the background screening results or, if the employee does so but is unsuccessful in changing the results, the employee will not qualify to be an authorized *RAPID*Gate badgeholder. Your company, and possibly also the participating facility(ies) and/or other agency of the United States government, will be so notified.

Eid Passport and/or its third-party background screening providers will NOT provide your company with a copy of the background screening reports or disclose to your company the contents of the background screening reports. Eid Passport may provide the participating facility(ies) and/or other United States government agency with the name and/or other identifying information of your company's employees who are authorized *RAPID*Gate badgeholders. In addition, depending upon the type of *RAPID*Gate badge that is issued to your company's authorized *RAPID*Gate badgeholders (see Section 5, below), Eid Passport also may provide your company, and/or the participating facility(ies) and/or other agency of the United States government, with records of the authorized *RAPID*Gate badgeholders' arrival and departure history, and/or records of their whereabouts, at the participating facility(ies).

YOU HEREBY AUTHORIZE EID PASSPORT AND/OR ITS THIRD-PARTY BACKGROUND SCREENING PROVIDER(S) TO RETAIN YOUR COMPANY'S EMPLOYEES' DATA, AND ANY UPDATES TO THAT DATA, FOR A COMMERCIALLY REASONABLE PERIOD OF TIME. EID PASSPORT AND ITS THIRD-PARTY BACKGROUND SCREENING PROVIDERS ARE COMMITTED TO MAINTAINING THIS DATA IN THE STRICTEST OF CONFIDENCE, AND FOLLOW STRINGENT FAIR INFORMATION PRACTICES IN ACCORDANCE WITH THE FCRA AND OTHER APPLICABLE LAWS AND REGULATIONS.

5. Rights and Obligations of Enrolled Companies and Authorized *RAPID*Gate Badgeholders

- *RAPIDGate badge*. The *RAPID*Gate badge is for the sole and exclusive use of the authorized *RAPID*Gate badgeholder. The *RAPID*Gate badgeholder may not share, lend or transfer his or her *RAPID*Gate badge to anyone else.

  The *RAPID*Gate badge by itself does not guarantee quick access to, or any access to, any participating facility. For security reasons and under applicable laws, rules and regulations, the participating facility always has the final say on who may enter, and under what circumstances.

  The *RAPID*Gate badge may be issued by Eid Passport, or it may be issued directly by the participating facility or another agency or department of the United States government. A government-issued *RAPID*Gate badge may entitle your company and/or its authorized *RAPID*Gate badgeholders to certain government privileges or rights, and/or impose upon your company and/or its authorized *RAPID*Gate badgeholders certain government obligations or restrictions, in addition to but outside of and unrelated to the *RAPID*Gate program. Eid Passport assumes no responsibility or liability whatsoever for government content or functions of government-issued *RAPID*Gate badges.

  In the event that an Eid Passport-issued *RAPID*Gate badge is lost, damaged or stolen, the authorized *RAPID*Gate badgeholder must immediately notify your company. In the event that a government-issued *RAPID*Gate badge is lost, damaged or stolen, the authorized *RAPID*Gate badgeholder must immediately notify

the government department or agency that issued the *RAPID*Gate badge, and follow the department's or agency's instructions and procedures. In addition, if an authorized *RAPID*Gate badgeholder stops working for your company, or is otherwise disqualified as an authorized *RAPID*Gate badgeholder, the individual must immediately return the *RAPID*Gate badge to your company or, in the case of a government-issued *RAPID*Gate badge, to the issuing government agency.

Depending upon the facility, the *RAPID*Gate badge may contain radio frequency identification ("RFID") or other identifying technology. Such technology allows Eid Passport to record when authorized *RAPID*Gate badgeholders arrive at and depart the participating facility, and/or to track the whereabouts of authorized *RAPID*Gate badgeholders while they are on-site at the facility. Please check with *RAPID*Gate Customer Service for details on whether the *RAPID*Gate badge issued to your company's authorized *RAPID*Gate badgeholders contains this technology.

- *Background screenings*. At any time or times while your company's employees are authorized *RAPID*Gate badgeholders, they are subject to periodic background screenings, as often as deemed required by Eid Passport and at its sole discretion. This is done to verify that at all times the employees continue to meet the *RAPID*Gate program eligibility requirements. (See Section 4, above.)

- *Designation of RAPID*Gate Company Administrator. As part of the enrollment process, your company must designate an employee to serve as its *RAPID*Gate Company Administrator. Please provide *RAPID*Gate Customer Service with the name, telephone number, postal address and email address of the Vendor Administrator, in the space provided in Part A, Enrollment Form, above.

- *Personnel or background changes affecting an authorized RAPID*Gate *badgeholder.* Your company must promptly notify *RAPID*Gate Customer Service of any changes in the employment or background status of its authorized *RAPID*Gate badgeholders that could affect their *RAPID*Gate eligibility. Circumstances giving rise to this duty to notify include but are not limited to an authorized *RAPID*Gate badgeholder's separation from employment; change in job duties eliminating the need to conduct official business on the participating facility(ies); felony or misdemeanor convictions; outstanding warrants; sexual offender convictions; or placement on Terrorist or OFAC watch lists.

- *Refunds*. No refunds will be made to or on behalf of your company, or to or on behalf of any of its employees, if an employee does not pass a *RAPID*Gate background screening or is disqualified as an authorized *RAPID*Gate badgeholder. In such event, your company and its employees will have no remedies or other financial recourse against Eid Passport or its related companies, officers, directors, employees, agents, subsidiaries or affiliates, or against any agency of the United States government.

6. *RAPIDGate* program renewal

a. Company renewal

*RAPID*Gate Customer Service will contact your company shortly before expiration of its *RAPID*Gate enrollment. If your company wishes to renew its enrollment, it may do so by paying the *RAPID*Gate enrollment renewal fee. *Your company's enrollment renewal is subject to the approval of the participating facility and to your company's continued eligibility in all other respects.*

b. Authorized *RAPID*Gate badgeholder renewals

If your company renews its enrollment for another term, *RAPID*Gate will notify it of the names of its authorized *RAPID*Gate badgeholders whose *RAPID*Gate badges are due to expire. Your company may authorize renewal of their *RAPID*Gate badges for another term, by paying their renewal fee. It may be necessary for the individuals to re-register at the Registration Station at the participating facility(ies). Renewal is contingent upon their passing a *RAPID*Gate background screening and in all other respects meeting the *RAPID*Gate program eligibility requirements. (See Section 4, above.)

Your company is responsible for deciding which *RAPID*Gate badges to renew. If an authorized *RAPID*Gate badgeholder does not wish his or her *RAPID*Gate badge to be renewed, he or she must so notify your company's *RAPID*Gate Company Administrator at least 45 days before expiration of the *RAPID*Gate badge. **YOU HEREBY AGREE, ON BEHALF OF YOUR COMPANY, THAT YOUR COMPANY WILL DEFEND, INDEMNIFY AND HOLD HARMLESS EID PASSPORT AND ITS RELATED COMPANIES, OFFICERS, DIRECTORS, EMPLOYEES, AGENTS, SUBSIDIARIES AND AFFILIATES, AND ANY AGENCY OF THE UNITED STATES GOVERNMENT, OF AND FROM ANY AND ALL CLAIMS, DEMANDS OR CAUSES OF ACTION ARISING FROM YOUR COMPANY'S RENEWAL, OR FAILURE TO RENEW, ANY *RAPID*Gate BADGE FOR ANY COMPANY EMPLOYEE.**

7. Grounds for revoking *RAPID*Gate program enrollment and access privileges

a. Your company

Your company's *RAPID*Gate enrollment is valid for a specified term, provided that at all times it meets the *RAPID*Gate program eligibility requirements. If at any time your company fails to meet any *RAPID*Gate program eligibility requirements, its enrollment will be subject to revocation. If at any time your company no longer is enrolled in the *RAPID*Gate program, its authorized *RAPID*Gate badgeholders no longer will be eligible for the *RAPID*Gate program, and their *RAPID*Gate badges will be deactivated.

Your company could lose its eligibility to be enrolled in the *RAPID*Gate program, and have its *RAPID*Gate enrollment revoked, on grounds including but not limited to:

- The participating facility(ies) for which your company is enrolled in the *RAPID*Gate program no longer participates in the *RAPID*Gate program
- The participating facility(ies), or other agency or department of the United States government, withdraws your company's authorization to be enrolled in the *RAPID*Gate program
- Your company does not pay its *RAPID*Gate enrollment or renewal fee
- Your company violates any term or condition of this Agreement
- An authorized *RAPID*Gate badgeholder of your company violates any term or condition of his or her *RAPID*Gate Individual User Agreement.

b. *RAPID*Gate badges

The *RAPID*Gate badges issued to your company's employees are valid for a specified term, provided that the employees at all times meet the *RAPID*Gate program eligibility requirements. If at any time an authorized *RAPID*Gate badgeholder fails to meet any of the *RAPID*Gate program eligibility requirements, the individual will lose his or her *RAPID*Gate program eligibility, and his or her *RAPID*Gate badge will be deactivated. Your company's authorized *RAPID*Gate badgeholders may lose their *RAPID*Gate program eligibility, and be subject to deactivation of their *RAPID*Gate badge, on grounds including but not limited to:

- The authorized *RAPID*Gate badgeholder no longer works for your company
- The authorized *RAPID*Gate badgeholder does not pass a *RAPID*Gate background screening
- The authorized *RAPID*Gate badgeholder's work functions no longer include visiting the participating facility(ies)
- Your company requests to remove the authorized *RAPID*Gate badgeholder from the *RAPID*Gate program
- Your company no longer is eligible, or otherwise ends its enrollment in, the *RAPID*Gate program
- The facility(ies) for which your company is enrolled in the *RAPID*Gate program no longer participates in the *RAPID*Gate program
- The facility(ies), or other agency or department of the United States government, withdraws your company's authorization to be enrolled in the *RAPID*Gate program
- The facility(ies), or other agency or department of the United States government, withdraws the individual's authorization as a *RAPID*Gate badgeholder and/or requires deactivation of the individual's *RAPID*Gate badge
- The authorized *RAPID*Gate badgeholder violates any term or condition of his or her *RAPID*Gate Individual User Agreement
- The authorized *RAPID*Gate badgeholder uses the *RAPID*Gate program to access the participating facility(ies) for any reason other than for official business.

8. General Restrictions, Limitations and Resolution of Disputes

- This enrollment does not by itself confer on your company or its employees any rights or privileges under the *RAPID*Gate program. Enrollment is subject to the approval of the participating facility(ies). In addition, your company's enrollment is subject to the terms and conditions set forth in this Agreement. Your company's employees who register for the *RAPID*Gate program are subject to the terms and conditions of their *RAPID*Gate Individual User Agreement.
- This enrollment does not guarantee your company's authorized *RAPID*Gate badgeholders access to any participating facility. The participating facility(ies) maintains the right to deny entrance to your company's authorized *RAPID*Gate badgeholders and to take any security precautions it deems necessary, including but not limited to conducting random inspections of your company's authorized *RAPID*Gate badgeholders and/or their vehicles.
- Your company's enrollment is valid only for the participating facility(ies) that have authorized your company to enroll in the *RAPID*Gate program and for which your company has enrolled.
- A participating facility may revoke your company's, and/or its authorized *RAPID*Gate badgeholders', access privileges under the *RAPID*Gate program at any time for any reason. You agree on behalf of your company that, in such event, your company and its employees have no financial, legal or other remedies against Eid Passport or any of its related companies, officers, directors, employees, agents, subsidiaries or affiliates, or against any agency of the United States Government.
- Eid Passport takes pride in its background screening service but cannot guarantee the accuracy of the data obtained. As explained in Section 4, above, your company's employees have the right to dispute a "fail" result of a *RAPID*Gate background screening. ***You agree on behalf of your company that neither your company, nor its employees, has any remedy, in equity or law, and will initiate no legal action, against* Eid Passport *or any of its related companies, officers, directors, employees, agents, subsidiaries or affiliates, or against any agency of the United States government, arising from any dispute over the accuracy or completeness of data derived from a RAPID*Gate *background screening, or arising from an employee not passing a RAPID*Gate *background screening.***

- *RAPID*Gate badges that are issued by the government may entitle the authorized *RAPID*Gate badgeholders and/or your company to certain government privileges or rights, or impose upon them certain government obligations or restrictions, in addition to but outside of and unrelated to the *RAPID*Gate program. Eid Passport assumes no responsibility or liability whatsoever for government content or functions of government-issued *RAPID*Gate badges. ***You agree on behalf of your company that neither your company, nor its employees, has any remedy, in equity or law, and will initiate no legal action, against Eid Passport or any of its related companies, officers, directors, employees, agents, subsidiaries or affiliates, arising from any dispute over any government content or functions of government-issued RAPIDGate badges.***
- Eid Passport contracts with one or more third parties to conduct *RAPID*Gate background screenings. Such third party(ies) conform to the highest standards of care with respect to protection of personally identifiable data. Eid Passport stores on its own servers only limited personally identifiable information on *RAPID*Gate participants. Eid Passport does not store on its servers, and maintains no database containing, the contents of background screenings conducted on *RAPID*Gate participants. Such data is stored with Eid Passport's third-party background screening provider(s). ***You agree on behalf of your company that neither your company nor its employees has any remedy, in equity or law, and will initiate no legal action, against Eid Passport or any of its related companies, officers, directors, employees, agents, subsidiaries or affiliates, arising from the storage of any personally identifiable data on any employee that is not maintained on Eid Passport's own servers or contained in Eid Passport's own database.***
- You agree that, if your company has a dispute with Eid Passport arising from or relating to the *RAPID*Gate program, your company will so notify Eid Passport in writing within six months of the event or the action giving rise to the dispute, at the address listed in Section A, Enrollment Form, above. You agree that your company will make every effort to resolve the dispute informally. You further agree that, in the event of a breach of this Agreement by Eid Passport, your company's sole and exclusive remedy will be an amount equal to your company's enrollment fee for the year in which the breach occurred.
- This Agreement is governed by the laws of the State of Oregon, notwithstanding conflicts of laws principles. You agree that any legal action brought under this Agreement must be brought in Washington County, Oregon. The prevailing party shall be entitled to recover its/his/her legal costs and attorney's fees.
- If any provision of this Agreement is found by a proper legal authority to be unenforceable, that provision shall be severed and the remainder of this Agreement shall continue in full force and effect.

This Agreement constitutes the entire agreement between your company and Eid Passport with respect to the *RAPID*Gate program. This Agreement supersedes any proposal or any prior or contemporaneous writings or other agreement, oral or written, and any other communications or representations between your company and Eid Passport relating to the *RAPID*Gate program.

I hereby (1) certify that I have the authority to bind my company to the terms and conditions of this Agreement; (2) accept, on behalf of my company, the terms and conditions of this Agreement; and (3) agree, on behalf of my company, to be bound by the terms and conditions of this Agreement.

_____ 31 Jan 2012_____
Name (Signed) Date

_____
Name (Printed)

_____
Title

_____
Name of company on whose behalf individual is signing

THE CITY OF KEY WEST
3140 Flagler St,
Key West, Florida 330-40

ADDENDUM #2
Repairs to Navy Mole Bulkhead 497
Invitation to Bid: 12-007
9 February 2012

This Addendum is issued as supplemental information to the bid package for clarification of certain matters of both a general and a technical nature. The referenced bid package is amended in accordance with the following items:

1. Alternate Bid Item: Milling and Paving: Contractor shall mill and pave the additional areas identified as 2 through 4 on the attached drawings. Asphalt shall be one 1.25" lift of FDOT S-1/SP12.5 or JMF equivalent topped with one 0.75" lift of FDOT S-3/SP9.5 or JMF equivalent for 2" total thickness... Existing drainage patterns shall be maintained. Attachment A is a drawing of the area. The City reserves the right to award to the Base Bid only or Base Bid plus Alternate Bid Item.
2. Specifications: See attached specification 32-01-16.17 Cold Milling and Paving shall act as the technical specification for the work covered under this addendum
3. Specifications: See attached specification 32-13-17 Hot Mix Bituminous Pavement (used at MCSF Blount Island) shall act as the technical specifications for the work covered under this addendum
4. Bid Sheet: Attached is a revised BID FORM and shall replace the Bid Form in section 00-41-13.

Attachment A

SECTION 32 01 16.17

COLD MILLING OF BITUMINOUS PAVEMENTS
08/08

PART 1 GENERAL

1.1 UNIT PRICES

1.1.1 Measurement

The quantity of milled pavement will be the number of square yards completed and accepted as determined by the Contracting Officer. Determine the number of square yards of milled pavement by measuring the length and width of the milled surface within the specified work area. Measurement to determine the area shall be to the closest inch for width and the closest foot for length.

1.1.2 Payment

Payment will be to the nearest square yard. No payment will be made for milling outside the specified area of work.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

1.3 SYSTEM DESCRIPTION

Maintain in a satisfactory working condition equipment, tools, and machines used in the performance of the work.

1.3.1 Cold-Milling Machine

Provide a cold-milling machine which is self-propelled, capable of milling the pavement to a specified depth and smoothness and of establishing grade control; with means of controlling transverse slope and dust produced during the pavement milling operation. The machine shall have the ability to remove the millings or cuttings from the pavement and load them into a truck. The milling machine shall not cause damage to any part of the pavement structure that is not to be removed.

1.3.2 Cleaning Equipment

Provide cleaning equipment suitable for removing and cleaning loose material from the pavement surface.

1.3.3 Straightedge

Furnish and maintain at the site, in good condition, one 12 foot straightedge or other suitable device for each milling machine, for testing the finished surface. Make straightedge available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal, with blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on the pavement.

1.4 QUALITY ASSURANCE

1.4.1 Grade

Conform the finished milled surfaces to the lines, grades, and cross sections indicated. The finished milled-pavement surfaces shall vary not more than 1/4 inch from the established plan grade line and elevation. Finished surfaces at a juncture with other pavements shall coincide with the finished surfaces of the abutting pavements. The deviations from the plan grade line and elevation will not be permitted in areas of pavements where closer conformance with planned grade and elevation is required for the proper functioning of appurtenant structures involved.

1.4.2 Surface Smoothness

Finished surfaces shall not deviate from the testing edge of a straightedge more than 1/4 inch in the transverse or longitudinal direction.

1.4.3 Traffic Control

Provide all necessary traffic controls during milling operations.

1.5 ENVIRONMENTAL REQUIREMENTS

Milling shall not be performed when there is accumulation of snow or ice on the pavement surface.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

Clean the pavement surface of excessive dirt, clay, or other foreign material immediately prior to milling the pavement.

3.2 MILLING OPERATION

A minimum of seven days notice is required, prior to start work, for the Contracting Officer to coordinate the milling operation with other activities at the site. Make sufficient passes so that the designated area is milled to the grades and cross sections indicated. The milling shall proceed with care and in depth increments that will not damage the pavement below the designated finished grade. Repair or replace, as directed, items damaged during milling such as manholes, valve boxes, utility lines, pavement that is torn, cracked, gouged, broken, or undercut. The milled material shall be removed from the pavement and loaded into trucks.

3.3 GRADE AND SURFACE-SMOOTHNESS TESTING

3.3.1 Grade-Conformance Tests

Test the finished milled surface of the pavement for conformance with the plan-grade requirements and for acceptance by the Contracting Officer by running lines of levels at intervals ofmeters 25 feet longitudinally and 25 feet transversely to determine the elevation of the completed pavement. Correct variations from the designated grade line and elevation in excess of the plan-grade requirements as directed. Skin patching for correcting low areas will not be permitted. Remove and replace the deficient low area. Remove sufficient material to allow at least 2 inches of asphalt concrete to be placed.

3.3.2 Surface-Smoothness Tests

After completion of the final milling, the finished milled surface will be tested by the Government with a straightedge. Other approved devices may be used, provided that when satisfactorily and properly operated, such devices reveal all surface irregularities exceeding the tolerances specified. Correct surface irregularities that depart from the testing edge by more than 1/4 inch. Skin patching for correcting low areas will not be permitted. Remove and replace the deficient low area. Remove sufficient material to allow at least 2 inches of asphalt concrete to be placed.

3.4 REMOVAL OF MILLED MATERIAL

Material that is removed shall become the property of the Contractor and removed from the site.

-- End of Section --

SECTION 32 12 17

HOT MIX BITUMINOUS PAVEMENT
04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO MP 1a	(2004) Performance Graded Asphalt Binder

ASPHALT INSTITUTE (AI)

AI MS-02	(2010) Mix Design Methods

ASTM INTERNATIONAL (ASTM)

ASTM C 117	(2004) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(2007) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C 128	(2007a) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
ASTM C 131	(2006)Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 188	(1995; R 2003) Standard Test Method for Density of Hydraulic Cement
ASTM C 29/C 29M	(2007) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C 88	(2005) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM D 1073	(2007) Fine Aggregate for Bituminous Paving Mixtures

ASTM D 1188	(2007) Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM D 1559	(1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D 2041	(2003a) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2172	(2005) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 242/D 242M	(2009) Mineral Filler for Bituminous Paving Mixtures
ASTM D 2726	(2009) Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D 4867/D 4867M	(2009) Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D 546	(2005) Sieve Analysis of Mineral Filler for Bituminous Paving Mixtures
ASTM D 692/D 692M	(2009) Coarse Aggregate for Bituminous Paving Mixtures
ASTM D 70	(2009e1) Specific Gravity and Density of Semi-Solid Bituminous Materials (Pycnometer Method)
ASTM D 75/D 75M	(2009) Standard Practice for Sampling Aggregates
ASTM D 854	(2006e1) Specific Gravity of Soil Solids by Water Pycnometer
ASTM D 979	(2001; R 2006e1) Sampling Bituminous Paving Mixtures
ASTM D 995	(1995b; R 2002) Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00.00 25 SUBMITTAL PROCEDURES:

SD-05 Design Data

Job-mix formula; G
Submit a job-mix formula, prepared specifically for this project

for approval by the Government prior to preparing and placing the bituminous mixture. Design mix using procedures contained in Chapter V, Marshall Method of Mix Design, of AI MS-02. Formulas shall indicate physical properties of the mixes as shown by tests made by a commercial laboratory approved by the Contracting Officer, using materials identical to those to be provided on this project. Submit formulas with material samples. Job-mix formula for each mixture shall be in effect until modified in writing by the Contractor and approved by the Contracting Officer. Provide a new job-mix formula for each source change. Submittal shall include all tests indicated in MIX DESIGN section of this specification.

ASPHALT CEMENT BINDER; G

MIX DESIGN; G

SD-06 Test Reports; G

Specific gravity test of asphalt; G

Coarse aggregate tests; G

Weight of slag test; G

Percent of crushed pieces in gravel; G

Fine aggregate tests; G

Specific gravity of mineral filler; G

Bituminous mixture tests; G

Aggregates tests; G

Bituminous mix tests; G

1.3 QUALITY ASSURANCE

1.3.1 Safety Requirements

Provide adequate and safe stairways with handrails to the mixer platform, and safe and protected ladders or other means for accessibility to plant operations. Guard equipment and exposed steam or other high temperature lines or cover with a suitable type of insulation.

1.3.2 Required Data

Job-mix formula shall show the following:

a. Source and proportions, percent by weight, of each ingredient of the mixture;

b. Correct gradation, the percentages passing each size sieve listed in the specifications for the mixture to be used, for the aggregate and mineral filler from each separate source and from each different size to be used in the mixture and for the composite mixture;

c. Amount of material passing the No. 200 sieve determined by dry sieving;

d. Number of blows of hammer compaction per side of molded specimen;

e. Temperature viscosity relationship of the asphalt cement;

f. Stability, flow, percent voids in mineral aggregate, percent air voids, unit weight;

g. Asphalt absorption by the aggregate;

h. Effective asphalt content as percent by weight of total mix;

i. Temperature of the mixture immediately upon completion of mixing;

j. Asphalt performance grade; and

k. Curves for the leveling and wearing courses.

1.3.3 Charts

Plot and submit, on a grain size chart, the specified aggregate gradation band, the job-mix gradation and the job-mix tolerance band.

1.3.4 Selection of Optimum Asphalt Content

Base selection on percent of total mix and the average of values at the following points on the curves for each mix:

a. Stability: Peak

b. Unit Weight: Peak

c. Percent Air Voids: Median

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage and store with a minimum of handling. Store aggregates in such a manner as to prevent segregation, contamination, or intermixing of the different aggregate sizes.

1.5 ENVIRONMENTAL CONDITIONS

Place bituminous mixture only during dry weather and on dry surfaces. Place courses only when the surface temperature of the underlying course is greater than 45 degrees F for course thicknesses greater than one inch and 55 degrees F for course thicknesses one inch or less.

1.6 CONSTRUCTION EQUIPMENT

Calibrated equipment, such as scales, batching equipment, spreaders and similar equipment, shall have been recalibrated by a calibration laboratory approved by the Contracting Officer within 12 months of commencing work.

1.6.1 Mixing Plant

Design, coordinate, and operate the mixing plant to produce a mixture within the job-mix formula tolerances and to meet the requirements of

ASTM D 995, including additional plant requirements specified herein. The plant shall be a batch type, continuous mix type or drum-dryer mixer type, and shall have sufficient capacity to handle the new bituminous construction. Minimum plant capacity shall be 100 tons per hour. The mixing plant and equipment shall remain accessible at all times for inspecting operation, verifying weights, proportions and character of materials, and checking mixture temperatures.

1.6.1.1 Cold Aggregate Feeder

Provide plant with a feeder or feeders capable of delivering the maximum number of aggregate sizes required in their proper proportion. Provide adjustment for total and proportional feed and feeders capable of being locked in any position. When more than one cold elevator is used, feed each elevator as a separate unit and install individual controls integrated with a master control.

1.6.1.2 Dryer

Provide rotary drum-dryer which continuously agitates the mineral aggregate during the heating and drying process. When one dryer does not dry the aggregate to specified moisture requirements, provide additional dryers.

1.6.1.3 Plant Screens and Bins for Batch and Continuous Mix Plants

Use screen to obtain accurate gradation and allow no bin to contain more than 10 percent oversize or undersize. Inspect screens each day prior to commencing work for plugged, worn, or broken screens. Clean plugged screens and replace worn or broken screens with new screens prior to beginning operations. Divide hot aggregate bins into at least three compartments arranged to ensure separate and adequate storage of appropriate fractions of the aggregate.

1.6.1.4 Testing Laboratory

Provide a testing laboratory for control and acceptance testing functions during periods of mix production, sampling and testing, and whenever materials subject to the provisions of these specifications are being supplied or tested. The laboratory shall provide adequate equipment, space, and utilities as required for the performance of the specified tests.

1.6.1.5 Surge and Storage Bins

Use for temporary storage of hot bituminous mixtures will be permitted under the following conditions:

a. When stored in surge bins for a period of time not to exceed 3 hours.

b. When stored in insulated and heated storage bins for a period of time not to exceed 12 hours. If it is determined by the Contracting Officer that there is an excessive amount of heat loss, segregation and oxidation of the mixture due to temporary storage, discontinue use of surge bins or storage bins.

1.6.1.6 Drum-Dryer Mixer

Do not use drum-dryer mixer if specified requirements of the bituminous mixture or of the completed bituminous pavement course cannot be met. If

drum-dryer mixer is prohibited, use either batch or continuous mix plants meeting the specifications and producing a satisfactory mix.

1.6.2 Paving Equipment

1.6.2.1 Spreading Equipment

Self-propelled electronically controlled type, unless other equipment is authorized by the Contracting Officer. Equip spreading equipment of the self-propelled electronically controlled type with hoppers, tamping or vibrating devices, distributing screws, electronically adjustable screeds, and equalizing devices. Capable of spreading hot bituminous mixtures without tearing, shoving, or gouging and to produce a finished surface of specified grade and smoothness. Operate spreaders, when laying mixture, at variable speeds between 5 and 45 feet per minute. Design spreader with a quick and efficient steering device; a forward and reverse traveling speed; and automatic devices to adjust to grade and confine the edges of the mixture to true lines. The use of a spreader that leaves indented areas or other objectionable irregularities in the fresh laid mix during operations is prohibited.

1.6.2.2 Rolling Equipment

Self-propelled pneumatic-tired rollers supplemented by three-wheel and tandem type steel wheel rollers. The number, type and weight of rollers shall be sufficient to compact the mixture to the required density without detrimentally affecting the compacted material. Rollers shall be suitable for rolling hot-mix bituminous pavements and capable of reversing without backlash. Pneumatic-tired rollers shall be capable of being operated both forward and backward without turning on the mat, and without loosening the surface being rolled. Equip rollers with suitable devices and apparatus to keep the rolling surfaces wet and prevent adherence of bituminous mixture. Vibratory rollers especially designed for bituminous concrete compaction may be used provided rollers do not impair stability of pavement structure and underlying layers. Repair depressions in pavement surfaces resulting from use of vibratory rollers. Rollers shall be self-propelled, single or dual vibrating drums, and steel drive wheels, as applicable; equipped with variable amplitude and separate controls for energy and propulsion.

1.6.2.3 Hand Tampers

Minimum weight of 25 pounds with a tamping face of not more than 50 square inches.

1.6.2.4 Mechanical Hand Tampers

Commercial type, operated by pneumatic pressure or by internal combustion.

PART 2 PRODUCTS

2.1 AGGREGATES

Grade and proportion aggregates and filler so that combined mineral aggregate conforms to specified grading.

2.1.1 Coarse Aggregates

ASTM D 692/D 692M, except as modified herein. At least 75 percent by weight of aggregate retained on the No. 4 sieve shall have two or more

fractured faces. Percentage of wear, Los Angeles test, except for slag, shall not exceed 40 in accordance with ASTM C 131. Weight of slag shall not be less than 70 pounds per cubic foot. Soundness test is required in accordance with ASTM C 88; after 5 cycles, loss shall not be more than 12 percent when tested with sodium sulfate or 18 percent when tested with magnesium sulfate.

2.1.2 Fine Aggregate

ASTM D 1073, except as modified herein. Fine aggregate shall be produced by crushing stone, slag or gravel that meets requirements for wear and soundness specified for coarse aggregate. Where necessary to obtain the gradation of aggregate blend or workability, natural sand may be used. Quantity of natural sand to be added shall be approved by the Contracting Officer and shall not exceed 15 percent of weight of coarse and fine aggregate and material passing the No. 200 sieve.

2.1.3 Mineral Filler

Nonplastic material meeting the requirements of ASTM D 242/D 242M.

2.1.4 Aggregate Gradation

The combined aggregate gradation shall conform to gradations specified in Table I, when tested in accordance with ASTM C 136 and ASTM C 117, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grade uniformly from coarse to fine.

Table I. Aggregate Gradations

Sieve Size, inch	Gradation 1 Percent Passing by Mass	Gradation 2 Percent Passing by Mass	Gradation 3 Percent Passing by Mass
1	100	---	---
3/4	76-96	100	---
1/2	68-88	76-96	100
3/8	60-82	69-89	76-96
No. 4	45-67	53-73	58-78
No. 8	32-54	38-60	40-60
No. 16	22-44	26-48	28-48
No. 30	15-35	18-38	18-38
No. 50	9-25	11-27	11-27
No. 100	6-18	6-18	6-18
No. 200	3-6	3-6	3-6

2.2 ASPHALT CEMENT BINDER

Asphalt cement binder shall conform to AASHTO MP 1a Performance Grade (PG) 64-10. Test data indicating grade certification shall be provided by the supplier at the time of delivery of each load to the mix plant. Copies of these certifications shall be submitted to the Contracting Officer. The supplier is defined as the last source of any modification to the binder.

2.3 MIX DESIGN

The Contractor shall develop the mix design. The asphalt mix shall be

composed of a mixture of well-graded aggregate, mineral filler if required, and asphalt material. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF). No hot-mix asphalt for payment shall be produced until a JMF has been approved. The hot-mix asphalt shall be designed using procedures contained in AI MS-02 and the criteria shown in Table II. If the Tensile Strength Ratio (TSR) of the composite mixture, as determined by ASTM D 4867/D 4867M is less than 75, the aggregates shall be rejected or the asphalt mixture treated with an approved anti-stripping agent. The amount of anti-stripping agent added shall be sufficient to produce a TSR of not less than 75. If an antistrip agent is required, it shall be provided by the Contractor at no additional cost.

2.3.1 JMF Requirements

The job mix formula shall be submitted in writing by the Contractor for approval at least 14 days prior to the start of the test section and shall include as a minimum:

a. Percent passing each sieve size.

b. Percent of asphalt cement.

c. Percent of each aggregate and mineral filler to be used.

d. Asphalt viscosity grade, penetration grade, or performance grade.

e. Number of blows of hammer per side of molded specimen.

f. Laboratory mixing temperature.

g. Lab compaction temperature.

h. Temperature-viscosity relationship of the asphalt cement.

i. Plot of the combined gradation on the 0.45 power gradation chart, stating the nominal maximum size.

j. Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content as shown in AI MS-02.

k. Specific gravity and absorption of each aggregate.

l. Percent natural sand.

m. Percent particles with two or more fractured faces (in coarse aggregate).

n. Fine aggregate angularity.

o. Percent flat or elongated particles (in coarse aggregate).

p. Tensile Strength Ratio.

q. Antistrip agent (if required) and amount.

r. List of all modifiers and amount.

s. Percentage and properties (asphalt content, binder properties, and aggregate properties) of RAP in accordance with paragraph RECYCLED HOT-MIX ASPHALT, if RAP is used.

Table II. Marshall Design Criteria

Test Property	75 Blow Mix
Stability, pounds minimum	*2150
Flow, 0.01 inch	8-16
Air voids, percent	3-5
Percent Voids in mineral aggregate (minimum)	See Table III
TSR, minimum percent	75

* This is a minimum requirement. The average during construction shall be significantly higher than this number to ensure compliance with the specifications.

Table III. Minimum Percent Voids in Mineral Aggregate (VMA)**

Aggregate (See Table 2)	Minimum VMA, percent
Gradation 1	13.0
Gradation 2	14.0
Gradation 3	15.0

** Calculate VMA in accordance with AI MS-02, based on ASTM D 2726 bulk specific gravity for the aggregate.

2.3.2 Adjustments to JMF

The JMF for each mixture shall be in effect until a new formula is approved in writing by the Contracting Officer. Should a change in sources of any materials be made, a new mix design shall be performed and a new JMF approved before the new material is used. The Contractor will be allowed to adjust the JMF within the limits specified below to optimize mix volumetric properties. Adjustments to the JMF shall be limited to plus or minus 3 percent on the 1/2 inch, No. 4, and No. 8 sieves; plus or minus 1.0 percent on the No. 200 sieve; and plus or minus 0.40 percent binder content. If adjustments are needed that exceed these limits, a new mix design shall be developed. Tolerances given above may permit the aggregate grading to be outside the limits shown in Table I; this is acceptable.

2.4 RECYCLED HOT MIX ASPHALT

Recycled HMA shall consist of reclaimed asphalt pavement (RAP), coarse aggregate, fine aggregate, mineral filler, and asphalt cement. The RAP shall be of a consistent gradation and asphalt content and properties. When RAP is fed into the plant, the maximum RAP chunk size shall not exceed

2 inches. The recycled HMA mix shall be designed using procedures contained in AI MS-02. The job mix shall meet the requirements of paragraph MIX DESIGN. RAP should only be used for shoulder surface course mixes and for any intermediate courses. The amount of RAP shall be limited to 30 percent.

2.4.1 RAP Aggregates and Asphalt Cement

The blend of aggregates used in the recycled mix shall meet the requirements of paragraph AGGREGATES. The percentage of asphalt in the RAP shall be established for the mixture design according to ASTM D 2172 using the appropriate dust correction procedure.

2.4.2 RAP Mix

The blend of new asphalt cement and the RAP asphalt binder shall meet the dynamic shear rheometer at high temperature and bending beam at low temperature requirements in paragraph ASPHALT CEMENT BINDER. The virgin asphalt cement shall not be more than two standard asphalt material grades different than that specified in paragraph ASPHALT CEMENT BINDER.

2.5 SOURCE QUALITY CONTROL

Employ a commercial laboratory approved by the Contracting Officer to perform testing. The laboratory used to develop the JMF and the laboratory used to perform all sampling and testing shall meet the requirements of ASTM D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

2.5.1 Tests

Perform testing in accordance with the following:

a. Specific Gravity Test of Asphalt: ASTM D 70

b. Coarse Aggregate Tests:

(1) Bulk Specific Gravity: ASTM C 127

(2) Abrasion Loss: ASTM C 131

(3) Soundness Loss: ASTM C 88

c. Weight of Slag Test: ASTM C 29/C 29M

d. Percent of Crushed Pieces in Gravel: Count by observation and weight

e. Fine Aggregate Tests:

(1) Bulk Specific Gravity: ASTM C 128

(2) Soundness Loss: ASTM C 88

f. Specific Gravity of Mineral Filler: ASTM C 188 or ASTM D 854

g. Bituminous Mixture Tests:

(1) Bulk Specific Gravity: ASTM D 1188 or ASTM D 2726

(2) Theoretical Maximum Specific Gravity: ASTM D 2041

(3) Tensile Strength Ratio: ASTM D 4867/D 4867M

2.5.2 Specimens

ASTM D 1559 for the making and testing of bituminous specimens with the following exception:

c. Cooling of Specimen: After compaction is completed, allow the specimen to cool in air to the same temperature approximately as that of the water, 77 degrees F, to be used in the specific gravity determination.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Preparation of Asphalt Binder Material

The asphalt cement material shall be heated avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of unmodified asphalts shall be no more than 160 degrees C 325 degrees F when added to the aggregates. Modified asphalts shall be no more than 174 degrees C 350 degrees F when added to the aggregate.

3.1.2 Preparation of Mineral Aggregates

Store different size aggregate in separate stockpiles so that different sizes will not mix. Stockpile different-sized aggregates in uniform layers by use of a clam shell or other approved method so as to prevent segregation. The use of bulldozers in stockpiling of aggregate or in feeding aggregate to the dryer is prohibited. Feed aggregates into the cold elevator by means of separate mechanical feeders so that aggregates are graded within requirements of the job-mix formulas and tolerances specified. Regulate rates of feed of the aggregates so that moisture content and temperature of aggregates are within tolerances specified herein. Dry and heat aggregates to the temperature necessary to achieve the mixture determined by the job mix formula within the job tolerance specified. Provide adequate dry storage for mineral filler.

3.1.3 Preparation of Bituminous Mixture

Accurately weigh aggregates and dry mineral filler and convey into the

mixer in the proportionate amounts of each aggregate size required to meet the job-mix formula. In batch mixing, after aggregates and mineral filler have been introduced into the mixer and mixed for not less than 15 seconds, add asphalt by spraying or other approved methods and continue mixing for a period of not less than 20 seconds, or as long as required to obtain a homogeneous mixture. The time required to add or spray asphalt into the mixer will not be added to the total wet-mixing time provided the operation does not exceed 10 seconds and a homogeneous mixture is obtained. When a continuous mixer is employed, mixing time shall be more than 35 seconds to obtain a homogeneous mixture. Additional mixing time, when required, will be as directed by the Contracting Officer. When mixture is prepared in a twin-pugmill mixer, volume of the aggregates, mineral filler, and asphalt shall not extend above tips of mixer blades when blades are in a vertical position. Overheated and carbonized mixtures, or mixtures that foam or show indication of free moisture, will be rejected. When free moisture is detected in batch or continuous mix plant produced mixtures, waste the mix and withdraw the aggregates in the hot bins immediately and return to the respective stockpiles; for drum-dryer mixer plants, waste the mix, including that in surge or storage bins that is affected by free moisture.

3.1.4 Transportation of Bituminous Mixtures

Transport bituminous material from the mixing plant to the paving site in trucks having tight, clean, smooth beds that have been coated with a minimum amount of concentrated solution of hydrated lime and water or other approved coating to prevent adhesion of the mixture to the truck. Petroleum products will not be permitted for coating truck. If air temperature is less than 60 degrees F or if haul time is greater than 30 minutes, cover each load with canvas or other approved material of ample size to protect the mixture from the loss of heat. Make deliveries so that the spreading and rolling of all the mixture prepared for one day's run can be completed during daylight, unless adequate approved artificial lighting is provided. Deliver mixture to area to be paved so that the temperature at the time of dumping into the spreader is within the range specified herein. Reject loads that are below minimum temperature, that have crusts of cold unworkable material, or that have been wet excessively by rain. Hauling over freshly laid material is prohibited.

3.1.5 Surface Preparation of Underlying Course

Prior to the laying of the asphalt concrete, clean underlying course of foreign or objectionable matter with power blowers or power brooms, supplemented by hand brooms and other cleaning methods where necessary. During the placement of multiple lifts of bituminous concrete, each succeeding lift of bituminous concrete shall have its underlying lift cleaned and provided with a bituminous tack coat if the time period between the placement of each lift of bituminous concrete exceeds 14 days, or the underlying bituminous concrete has become dirty.

3.2 PLACEMENT

3.2.1 Machine Spreading

The range of temperatures of the mixtures at the time of spreading shall be between 250 degrees F and 300 degrees F. Bituminous concrete having temperatures less than minimum spreading temperature when dumped into the spreader will be rejected. Adjust spreader and regulate speed so that the

surface of the course is smooth and continuous without tears and pulling, and of such depth that, when compacted, the surface conforms with the cross section, grade, and contour indicated. Unless otherwise directed, begin the placing along the centerline of areas to be paved on a crowned section or on the high side of areas with a one-way slope. Place mixture in consecutive adjacent strips having a minimum width of 10 feet, except where the edge lanes require strips less than 10 feet to complete the area. Construct longitudinal joints and edges to true line markings. Establish lines parallel to the centerline of the area to be paved, and place string lines coinciding with the established lines for the spreading machine to follow. Provide the number and location of the lines needed to accomplish proper grade control. When specified grade and smoothness requirements can be met for initial lane construction by use of an approved long ski-type device of not less than 30 feet in length and for subsequent lane construction by use of a short ski or shoe, in-place string lines for grade control may be omitted. Place mixture as nearly continuous as possible and adjust the speed of placing as needed to permit proper rolling.

3.2.2 Shoveling, Raking, and Tamping After Machine-Spreading

Shovelers and rakers shall follow the spreading machine. Add or remove hot mixture and rake the mixture as required to obtain a course that when completed will conform to requirements specified herein. Broadcasting or fanning of mixture over areas being compacted is prohibited. When segregation occurs in the mixture during placing, suspend spreading operation until the cause is determined and corrected. Correct irregularities in alignment left by the spreader by trimming directly behind the machine. Immediately after trimming, compact edges of the course by tamping laterally with a metal lute or by other approved methods. Distortion of the course during tamping is prohibited.

3.2.3 Hand-Spreading in Lieu of Machine-Spreading

In areas where the use of machine spreading is impractical, spread mixture by hand. The range of temperatures of the mixtures when dumped onto the area to be paved shall be between 250 and 300 degrees F. Mixtures having temperatures less than minimum spreading temperature when dumped onto the area to be paved will be rejected. Spread hot mixture with rakes in a uniformly loose layer of a thickness that, when compacted, will conform to the required grade, thickness, and smoothness. During hand spreading, place each shovelful of mixture by turning the shovel over in a manner that will prevent segregation. Do not place mixture by throwing or broadcasting from a shovel. Do not dump loads any faster than can be properly handled by the shovelers and rakers.

3.3 COMPACTION OF MIXTURE

Compact mixture by rolling. Begin rolling as soon as placement of mixture will bear rollers. Delays in rolling freshly spread mixture shall not be permitted. Start rolling longitudinally at the extreme sides of the lanes and proceed toward center of pavement, or toward high side of pavement with a one-way slope. Operate rollers so that each trip overlaps the previous adjacent strip by at least one foot. Alternate trips of the roller shall be of slightly different lengths. Conduct tests for conformity with the specified crown, grade and smoothness immediately after initial rolling. Before continuing rolling, correct variations by removing or adding materials as necessary. If required, subject course to diagonal rolling with the steel wheeled roller crossing the lines of the previous rolling

while mixture is hot and in a compactible condition. Speed of the rollers shall be slow enough to avoid displacement of hot mixture. Correct displacement of mixture immediately by use of rakes and fresh mixture, or remove and replace mixture as directed. Continue rolling until roller marks are eliminated and course has a density of at least 96 percent but not more than 100 percent of that attained in a laboratory specimen of the same mixture prepared in accordance with ASTM D 1559. During rolling, moisten wheels of the rollers enough to prevent adhesion of mixture to wheels, but excessive water is prohibited. Operation of rollers shall be by competent and experienced operators. Provide sufficient rollers for each spreading machine in operation on the job and to handle plant output. In places not accessible to the rollers, compact mixture thoroughly with hot hand tampers. Skin patching of an area after compaction is prohibited. Remove mixture that becomes mixed with foreign materials or is defective and replace with fresh mixture compacted to the density specified herein. Roller shall pass over unprotected edge of the course only when laying of course is to be discontinued for such length of time as to permit mixture to become cold.

3.4 JOINTS

Joints shall present the same texture and smoothness as other portions of the course, except permissible density at the joint may be up to 2 percent less than the specified course density. Carefully make joints between old and new pavement or within new pavements in a manner to ensure a thorough and continuous bond between old and new sections of the course. Vertical contact surfaces of previously constructed sections that are coated with dust, sand, or other objectionable material shall be painted with a thin uniform coat of emulsion or other approved bituminous material just before placing fresh mixture.

3.4.1 Transverse

Roller shall pass over unprotected end of freshly laid mixture only when laying of course is to be discontinued. Except when an approved bulkhead is used, cut back the edge of previously laid course to expose an even, vertical surface for the full thickness of the course. When required, rake fresh mixture against joints, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll. Transverse joints in adjacent lanes shall be offset a minimum of 2 feet.

3.4.2 Longitudinal Joints

Space 6 inches apart. Do not allow joints to coincide with joints of existing pavement or previously placed courses. Spreader screed shall overlap previously placed lanes 2 to 3 inches and be of such height to permit compaction to produce a smooth dense joint. With a lute, push back mixture placed on the surface of previous lanes to the joint edge. Do not scatter mix. Remove and waste excess material. When edges of longitudinal joints are irregular, honeycombed, or poorly compacted, cut back unsatisfactory sections of joint and expose an even vertical surface for the full thickness of the course. When required, rake fresh mixture against joint, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll while hot.

3.5 FIELD QUALITY CONTROL

3.5.1 Sampling

3.5.1.1 Aggregates At Source

Prior to production and delivery of aggregates, take at least one initial sample in accordance with ASTM D 75/D 75M from each stockpile. Collect each sample by taking three incremental samples at random from the source material to make a composite sample of not less than 50 pounds. Repeat the sampling when the material source changes or when testing reveals unacceptable deficiencies or variations from the specified grading of materials.

3.5.1.2 Cold Feed Aggregate Sampling

Take two samples daily from the belt conveying materials from the cold feed. Collect materials in three increments at random to make a representative composite sample of not less than 50 pounds. Take samples in accordance with ASTM D 75/D 75M.

3.5.1.3 Coarse and Fine Aggregates

Take a 50 pound sample from the cold feed at least once daily for sieve analyses and specific gravity tests. Additional samples may be required to perform more frequent tests when analyses show deficiencies, or unacceptable variances or deviations. The method of sampling is as specified herein for aggregates.

3.5.1.4 Mineral Filler

ASTM D 546. Take samples large enough to provide ample material for testing.

3.5.1.5 Pavement and Mixture

Take plant samples for the determination of mix properties and field samples for thickness and density of the completed pavements. Furnish tools, labor and material for samples, and satisfactory replacement of pavement. Take samples and tests at not less than frequency specified hereinafter and at the beginning of plant operations; for each day's work as a minimum; each change in the mix or equipment; and as often as directed. Accomplish sampling in accordance with ASTM D 979.

3.5.2 Testing

3.5.2.1 Aggregates Tests

a. Gradation: ASTM C 136.

b. Mineral Filler Content: ASTM D 546.

c. Abrasion: ASTM C 131 for wear (Los Angeles test). Perform one test initially prior to incorporation into the work and each time the source is changed.

3.5.2.2 Bituminous Mix Tests

Test one sample for each 500 tons, or fraction thereof, of the uncompacted

mix for extraction in accordance with ASTM D 2172; perform a sieve analysis on each extraction sample in accordance with ASTM C 136 and ASTM C 117. Test one sample for each 500 tons or fraction thereof for stability and flow in accordance with ASTM D 1559. Test one sample for each material blend for Tensile Strength Ratio in accordance with ASTM D 4867/D 4867M.

3.5.2.3 Pavement Courses

Perform the following tests:

a. Density: For each 1000 tons of bituminous mixture placed, determine the representative laboratory density by averaging the density of four laboratory specimens prepared in accordance with ASTM D 1559. Samples for laboratory specimens shall be taken from trucks delivering mixture to the site; record in a manner approved by the Contracting Officer the project areas represented by the laboratory densities. From each representative area recorded, determine field density of pavement by averaging densities of 4 inch diameter cores obtained from leveling, wearing courses; take one core for each 2000 square yards or fraction thereof of course placed. Determine density of laboratory prepared specimens and cored samples in accordance with ASTM D 1188 or ASTM D 2726, as applicable. Separate pavement layers by sawing or other approved means. Maximum allowable deficiency at any point, excluding joints, shall not be more than 2 percent less than the specified density for any course. The average density of each course, excluding joints, shall be not less than the specified density. Joint densities shall not be more than 2 percent less than specified course densities and are not included when calculating average course densities. When the deficiency exceeds the specified tolerances, correct each such representative area or areas by removing the deficient pavement and replacing with new pavement.

b. Thickness: Determine thickness of wearing courses from samples taken for the field density test. The maximum allowable deficiency at any point shall not be more than 1/4 inch less than the thickness for the indicated course. Average thickness of course or of combined courses shall be not less than the indicated thickness. Where a deficiency exceeds the specified tolerances, correct each such representative area or areas by removing the deficient pavement and replacing with new pavement.

c. Smoothness: Straightedge test the compacted surface of the wearing course as work progresses. Apply straightedge parallel with and at right angles to the centerline after final rolling. Unevenness of leveling courses shall not vary more than 1/4 inch in 10 feet; variations in the wearing course shall not vary more than 1/8 inch in 10 feet. Correct each portion of the pavement showing irregularities greater than that specified.

d. Finished Grades: Finish grades of each course placed shall not vary from the finish elevations, profiles, and cross sections indicated by more than 1/2 inch. Finished surface of the final wearing course will be tested by the Contracting Officer by running lines of levels at intervals of 25 feet longitudinally and transversely to determine elevations of completed pavement. The Contracting Officer will inform the Contractor in writing of paved areas that fail to meet the final grades indicated within the

specified tolerances. Correct deficient paved areas by removing existing work and replacing with new materials that meet the specifications. Skin patching for correcting low areas is prohibited.

e. Finish Surface Texture of Wearing Course: Visually check final surface texture for uniformity and reasonable compactness and tightness. Final wearing course with a surface texture having undesirable irregularities such as segregation, cavities, pulls or tears, checking, excessive exposure of coarse aggregates, sand streaks, indentations, ripples, or lack of uniformity shall be removed and replaced with new materials.

3.6 PROTECTION

Do not permit vehicular traffic, including heavy equipment, on pavement until surface temperature has cooled to at least 120 degrees F. Measure surface temperature by approved surface thermometers or other satisfactory methods.

-- End of Section --

NOTE TO BIDDER: Use preferably BLACK ink for completing this Bid form.

BID FORM

To: The City of Key West

Address: 3140 Flagler Ave, Key West, Florida 33040

Project Title: REPAIRS TO BULKHEAD 497 US NAVY MOLE

City of Key West Project No.: ITB NUMBER 12-007

Bidder's person to contact for additional information on this Bid:

Name: _____

Telephone: _____

BIDDER'S DECLARATION AND UNDERSTANDING

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Bid are those named herein, that this Bid is, in all respects, fair and without fraud, that it is made without collusion with any official of the Owner, and that the Bid is made without any connection or collusion with any person submitting another Bid on this Contract.

The Bidder further declares that he has carefully examined the Contract Documents for the construction of the project, that he has personally inspected the site, that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the Work and to identify the said quantities with the detailed requirements of the Contract Documents, and that this Bid is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Bid.

The Bidder further agrees, as evidenced by signing the Bid, that if awarded a Contract, the Florida Trench Safety Act and applicable trench safety standards will be complied with.

CONTRACT EXECUTION AND BONDS

The Bidder agrees that if this Bid is accepted, he will, within 10 days, not including Sundays and legal holidays, after Notice of Award, sign the Contract in the form annexed hereto, and will at that time, deliver to the Owner examples of the Performance Bond and Payment Bond required herein, and evidence of holding required licenses and certificates, and will, to the extent of his Bid, furnish all machinery, tools, apparatus, and other means of construction and do the Work and furnish all the materials necessary to complete all work as specified or indicated in the Contract Documents.

CERTIFICATES OF INSURANCE

Bidder agrees to furnish the Owner, before commencing the Work under this Contract, the certificates of insurance as specified in these Documents.

START OF CONSTRUCTION AND CONTRACT COMPLETION TIMES

The Bidder agrees to begin work within 10 calendar days after the date of the Notice to Proceed and to achieve Substantial Completion within 270 calendar days from the date when the Contract Times commence to run as provided in paragraph 2.03.A of the General Conditions, and Work will be completed and ready for final payment and acceptance in accordance with paragraph 14.07 of the General Conditions within 270 calendar days from the date when the Contract Times commence to run.

LIQUIDATED DAMAGES

In the event the Bidder is awarded the Contract, Owner and Bidder recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph Start of Construction and Contract Completion Times above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. Owner and Bidder also recognize the delays, expense, and difficulties involved in proving in a legal or other dispute resolution preceding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Bidder agree that as liquidated damages for delay (but not as a penalty) Bidder shall pay Owner $400 per day for each day that expires after the time specified for substantial completion.

After Substantial Completion, if Bidder neglects, refuses, or fails to complete the remaining Work within the Contract Times or any Owner-granted extension thereof, Bidder shall pay Owner $400 for each day that expires after the time specified in paragraph Start of Construction and Contract Completion Times, above for completion and readiness for final payment. Liquidated damages shall run concurrent.

Owner will recover such liquidated damages by deducting the amount owed from the final payment or any retainage held by Owner.

ADDENDA

The Bidder hereby acknowledges that he has received Addenda Nos. _____, _____, ____, _____, ____, (Bidder shall insert No. of each Addendum received) and agrees that all addenda issued are hereby made part of the Contract Documents, and the Bidder further agrees that his Bid(s) includes all impacts resulting from said addenda.

SALES AND USE TAXES

The Bidder agrees that all federal, state, and local sales and use taxes are included in the stated Bid Prices for the Work. Cash allowances DO NOT include any sales and use tax. Equipment allowance includes taxes as shown in Equipment Suppliers' Bid.

PUBLIC ENTITY CRIMES

"A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods

or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list."

COMBINED UNIT PRICE AND LUMP SUM WORK

The Bidder further proposes to accept as full payment for the Work proposed herein the amounts computed under the provisions of the Contract Documents. For unit price bid items, the estimate of quantities of work to be done is tabulated in the Proposal and, although stated with as much accuracy as possible, is approximate only and is assumed solely for the basis of calculation upon which the award of Contract shall be made. For lump sum bid items, it is expressly understood that the amounts are independent of the exact quantities involved. The Bidder agrees that the amounts for both unit price and lump sum work represent a true measure of labor and materials required to perform the Work, including all allowances for inspection, testing, overhead and profit for each type of work called for in these Contract Documents. The amounts shall be shown in both words and figures. In case of discrepancy, the amount shown in words shall govern.

DEWATERING PERMIT

Bidder further acknowledges that they maybe required to obtain a dewatering permit as required by the South Florida Water Management District (SFWMD). Bidder acknowledges that the City will pay the actual costs of the permit(s) as charged by the South Florida Water Management District. The contractor shall estimate his cost in obtaining this permit and submit it in the bid.

Bidder will complete the Work in accordance with the Contract Documents for a fixed fee price.

Repairs to Bulkhead 497: US. Navy Mole
LUMP SUM BID PRICE (Contractor shall verify quantities)

Item Description	Quantity	Unit	Unit Price	Cost
Permits (actual Costs to be paid by the City)				
Dewatering Permit SFWMD	1	EA		
Substructure				
Encasement (concrete cap)		CY		
Rebar		LB		
Install dowels		EA		
Coating		SF		
Install steel sheet pile		SF		
Sheet pile shoes		EA		
Rock Anchor Wale		LF		
Drill through existing steel sheet pile		EA		
Install Rock Anchors		EA		
Install Flowable Fill Material		CY		
Superstructure				
Replace Frames and Covers		EA		
Deck Components				
Install Concrete Apron		CY		
Install Bituminous pavement		TN		
Excavation/Backfill		CY		
Electrical Utilities				
Electrical	1	LS		
Telecommunications/Security	1	LS		
In-Water or Overwater Demolition				
Demobilization/Site Preparation	1	LS		

Base Bid _____

Addendum 2 Paving (alternate Bid Item)					
	Area 2	159,573	SF		
	Area 3	18,216	SF		
	Area 4	24,134	SF		

Alternate Bid Item (Paving) _____

TOTAL BASE BID ITEM PLUS ALTERNATE BID ITEM:

_____Dollars

(Amount written in words has precedence)

and _____Cents

TOTAL BASE BID ITEM PLUS ALTERNATE BID ITEM $_____

(numerals)

The City reserves the right to award to the Base Bid only or Base Bid plus Alternate Bid Item (Paving).

SUBCONTRACTORS

The Bidder further proposes that the following subcontracting firms or businesses will be awarded subcontracts for the following portions of the Work in the event that the Bidder is awarded the Contract:

_____
Name

_____ _____ _____
Street City State Zip

_____
Name

_____ _____ _____
Street City State Zip

_____
Name

_____ _____ _____
Street City State Zip

_____
Name

_____ _____ _____
Street City State Zip

Surety

_____whose address is

_____ _____ _____
Street City State Zip

Bidder

The name of the Bidder submitting this Bid is _____

_____ doing business at

_____ _____ _____

Street City State Zip

which is the address to which all communications concerned with this Bid and with the Contract shall be sent.

The names of the principal officers of the corporation submitting this Bid, or of the partnership, or of all persons interested in this Bid as principals are as follows:

_____ _____

_____ _____

_____ _____

If Sole Proprietor or Partnership

IN WITNESS hereto the undersigned has set his (its) hand this ___ day of _____ 20___.

_____

Signature of Bidder

_____

Title

If Corporation

IN WITNESS WHEREOF the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers this ___ day of 20___.

(SEAL)

_____
Name of Corporation

By: _____

Title: _____

Attest: _____
Secretary

END OF SECTION

THE CITY OF KEY WEST
3140 Flagler St,
Key West, Florida 330-40

ADDENDUM #3
Repairs to Navy Mole Bulkhead 497
Invitation to Bid: 12-007
21 February 2012

This Addendum is issued as supplemental information to the bid package for clarification of certain matters of both a general and a technical nature. The referenced bid package is amended in accordance with the following items:

1. Page 00-21-13-5: I. Florida Trench Safety Act: This paragraph/requirement is deleted
2. Section 00-44-02 Non-Collusion Declaration and Compliance: See attached form
3. Section 00-44-04 Suspension and Debarment Certification: See attached form
4. The bid opening date is hereby moved to 3pm on 8 March 2012

NON-COLLUSION DECLARATION AND COMPLIANCE WITH 49 CFR §29.

ITEM/SEGMENT NO.:_____
F.A.P. NO.:
PARCEL NO.:
COUNTY OF:
BID LETTING OF:_____ ,_____

I, _____, hereby
(NAME)
declare that I am_____ of_____
(TITLE) (FIRM)
Of_____
(CITY AND STATE)
and that I am the person responsible within my firm for the final decision as to the price(s) and amount of this Bid on this Project.

I further declare that:

1. The prices(s) and amount of this bid have been arrived at independently, without consultation, communication or agreement, for the purpose of restricting competition with any other contractor, bidder or potential bidder.

2. Neither the price(s) nor the amount of this bid have been disclosed to any other firm or person who is a bidder or potential bidder on this project, and will not be so disclosed prior to the bid opening.

3. No attempt has been made or will be made to solicit, cause or induce any other firm or person to refrain from bidding on this project, or to submit a bid higher than the bid of this firm, or any intentionally high or non-competitive bid or other form of complementary bid.

4. The bid of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary bid.

5. My firm has not offered or entered into a subcontract or agreement regarding the purchase of materials or services from any firm or person, or offered, promised or paid cash or anything of value to any firm or person, whether in connection with this or any other project, in consideration for an agreement or promise by any firm or person to refrain from bidding or to submit a complementary bid on this project.

6. My firm has not accepted or been promised any subcontract or agreement regarding the sale of materials or services to any firm or person, and has not been promised or paid cash or anything of value by any firm or person, whether in connection with this or any other project, in consideration for my firm's submitting a complementary bid, or agreeing to do so, on this project.

7. I have made a diligent inquiry of all members, officers, employees, and agents of my firm with responsibilities relating to the preparation, approval or submission of my firm's bid on this project and have been advised by each of them that he or she has not participated in any communication, consultation, discussion, agreement, collusion, act or other conduct inconsistent with any of the statements and representations made in this Declaration.

8. As required by Section 337.165, Florida Statutes, the firm has fully informed the City of Key West in writing of all convictions of the firm, its affiliates (as defined in Section 337.165(l)(a),

Florida Statutes), and all directors, officers, and employees of the firm and its affiliates for violation of state or federal antitrust laws with respect to a public contract or for violation of any state or federal law involving fraud, bribery, collusion, conspiracy or material misrepresentation with respect to a public contract. This includes disclosure of the names of current employees of the firm or affiliates who were convicted of contract crimes while in the employ of another company.

9. I certify that, except as noted below, neither my firm nor any person associated therewith in the capacity of owner, partner, director, officer, principal, investigator, project director, manager, auditor, and/or position involving the administration of Federal funds:

(a) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions, as defined in 49 CFR §29.110(a), by any Federal department or agency;

(b) has within a three-year period preceding this certification been convicted of or had a civil judgment rendered against him or her for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a Federal, State or local government transaction or public contract; violation of Federal or State antitrust statutes; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property;

(c) is presently indicted for or otherwise criminally or civilly charged by a Federal, State or local governmental entity with commission of any of the offenses enumerated in paragraph 9(b) of this certification; and

(d) has within a three-year period preceding this certification had one or more Federal, State or local government public transactions terminated for cause or default..

10. I(We), certify that I(We), shall not knowingly enter into any transaction with any subcontractor, material supplier, or vendor who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this contract by any Federal Agency unless authorized by the Department.

Where I am unable to declare or certify as to any of the statements contained in the above stated paragraphs numbered (1) through (10), I have provided an explanation in the "Exceptions" portion below or by attached separate sheet.

EXCEPTIONS:

(Any exception listed above will not necessarily result in denial of award, but will be considered in determining bidder responsibility. For any exception noted, indicate to whom it applies, initiating agency and dates of agency action.

Providing false information may result in criminal prosecution and/or administrative sanctions.)

I declare under penalty of perjury that the foregoing is true and correct.

CONTRACTOR: (Seal)

BY:_____ WITNESS:_____
NAME AND TITLE PRINTED

BY:_____ WITNESS:_____
SIGNATURE

Executed on this_____ day of_____, _____

FAILURE TO FULLY COMPLETE AND EXECUTE THIS DOCUMENT MAY RESULT IN THE BID BEING DECLARED NONRESPONSIVE

SUSPENSION AND DEBARMENT CERTIFICATION

CERTIFICATION REGARDING DEBARMENTS, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION-LOWER TIER FEDERALLY FUNDED TRANSACTIONS

1. The undersigned hereby certifies that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. The undersigned also certifies that it and its principals:
(a) Have not within a three-year period preceding this certification been convicted of or had a civil judgment rendered
against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.
(b) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 2.(a) of this Certification; and
(c) Have not within a three-year period preceding this certification had one or more public transactions (Federal, State or local) terminated for cause or default.

3. Where the undersigned is unable to certify to any of the statements in this certification, an explanation shall be attached to this certification.

Dated this day of, 20___.
By_____
Authorized Signature/Contractor

_____
Typed Name/Title

_____
Contractor's Firm Name

_____
Street Address

_____
Building, Suite Number

_____
City/State/Zip Code

_____
Area Code/Telephone Number

THE CITY OF KEY WEST
Post Office Box 1409
Key West, Fl. 33041-1409

ADDENDUM #4
Repairs to Navy Mole Bulkhead 497
Invitation to Bid: 12-007
06 March 2012

This Addendum is issued as supplemental information to the bid package for clarification of certain matters of both a general and a technical nature. The referenced bid package is amended in accordance with the following items:

The bid opening date is hereby moved to 3:00 PM on 14 March, 2012

All Bidders shall acknowledge receipt and acceptance of this Addendum No. 4 by acknowledging Addendum in their proposal or by submitting the addendum with the bid package. Bids submitted without acknowledgement or without this Addendum may be considered non-responsive.

_____ _____

Signature **Name of Business**

THE CITY OF KEY WEST
3140 Flagler St,
Key West, Florida 330-40

ADDENDUM #5
Repairs to Navy Mole Bulkhead 497
Invitation to Bid: 12-007
8 March 2012

This Addendum is issued as supplemental information to the bid package for clarification of certain matters of both a general and a technical nature. The referenced bid package is amended in accordance with the following items:

1. Section 21-13 #19: Schedule Impacts that affect the Bid; Add the following to this section:
   c. TOTLUS EXERCISE: That the U.S. Navy will be holding an exercise from 1 Sept 2012 to 7 Sept 2012. No work will be permitted at the site during this exercise.

2. Specification 31 68 13 SOIL AND ROCK ANCHORS: Replace this specification with the Specification that is attached to this Addendum: Clarification of the rock anchor angle of inclination was made in section 1.4.3(a) and the horizontal tolerances for the hole location was modified in section 3.1.7.1.

3. Specification 05 12 00 STRUCTURAL STEEL: Replace this specification with the Specification that is attached to this Addendum: A submittal, "Field Quality Control", (see 3.7) was added in order to provide results of weld inspections for review.

4. Section 00-44-02: Disclosure of Lobbying Activities Form: Delete from Table of Contents: Not Required by City

5. Addendum Acknowledgement Sheet: See Attached form and submit with bid

6. Geotechnical Report: The complete Geotechnical Report is attached

7. Section 00-41-13: Bid Form: See revised Bid Form

8. Response to Requests for Information from Contractors: See attached Sheet

All Bidders shall acknowledge receipt and acceptance of this Addendum No 5 by acknowledging Addendum in their proposal or by submitting the addendum with the bid package. Bids submitted without acknowledgement or without this Addendum may be considered non-responsive

_____ _____

Signature Name Of Business

SECTION 31 68 13

SOIL AND ROCK ANCHORS
11/08

PART 1 GENERAL

1.1 COMMENTARY

The work covered by this section of the specifications includes but may not be limited to furnishing all plant, labor, supervision, equipment, appliances and materials required to perform all operations in connection with the installation and performance testing of demonstration test anchors, with the installation and successful proof testing of all production rock anchors in accordance with this section of the specifications and the applicable contract drawings.

This section specifies test anchors and production anchors, including corrosion protection system, drilling, grouting, and stressing.

This section also specifies performance tests, lift-off tests, and proof tests of rock anchors, rock dowels, and tie-down anchors.

Design working load for each rock anchor at the sheet pile wall is 128 kip.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 301	(2005; Errata 2008) Specifications for Structural Concrete

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 252	(2008) Corrugated Polyethylene Drainage Pipe

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2005) Steel Construction Manual

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 5CT	(2005; Errata 2006; Errata 2006) Specification for Casing and Tubing

ASTM INTERNATIONAL (ASTM)

ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 500	(2007) Standard Specification for

	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 53	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 536	(1984e1; R 2004) Standard Specification for Ductile Iron Castings
ASTM A 722	(2007) Standard Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete
ASTM A 775	(2007b) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A 775/A 775M	(2007b) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM C 109	(2008) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
ASTM C 1107	(2008) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 144	(2004) Standard Specification for Aggregate for Masonry Mortar
ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 33	(2007) Standard Specification for Concrete Aggregates
ASTM D 1248	(2005) Polyethylene Plastics Extrusion Materials for Wire and Cable
ASTM D 1784	(2008) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D 3350	(2008) Polyethylene Plastics Pipe and Fittings Materials
ASTM D 4101	(2008) Standard Specification for Polypropylene Injection and Extrusion Materials

POST-TENSIONING INSTITUTE (PTI)

PTI 4	(June 1996) Recommendations for Prestressed Rock and Soil Anchors
PTI 8	(1985) Specifications for Unbonded Single Strand Tendons
PTI A	(Nov 1990) Post-Tensioning Manual

1.3 DEFINITIONS

Rock Anchors - Post-tensioned rock anchors at sheet pile wall, double corrosion protected (CLASS I)

The following definitions are in addition to those given in PTI 4, Section 2.0:

Anchored Structure - The wall, foundation or other structure to which the anchor is to transfer force.

Demonstration Test Anchor - An anchor which is performance tested to verify design assumptions and installation practices.

1.4 SYSTEM DESCRIPTION

Prior to commencing any work on the anchors, the Contractor, including all field personnel to be involved in drilling and installation of the anchors, shall meet with the Contracting Officer to review the drawings and specifications, work plans, and submittals. Drilling may commence upon approval of the anchor installation plan and procedures described in paragraph SUBMITTALS and after the conduct of the Preparatory Meeting.

1.4.1 General Requirements

The work includes design, fabrication and installation of the rock anchor system. The anchors shall be fabricated and installed as shown on the drawings. Prepare fabrication and installation drawings and an installation plan for approval. Rock anchors shall be threaded bar type.

1.4.2 Scope of work

Provide the design of the rock anchor system that will be completely the Contractor's responsibility. General design criteria are shown on the drawings. Additional subsurface and geotechnical information is contained in the geotechnical report, available in the bid documents or from the contracting officer. The materials, design, stressing, load testing, and acceptance shall be in accordance with PTI 4 and these specifications. Rock anchors shall be threaded bar type. The Contractor is responsible for the design of the anchor, jacking wedge and bearing plate, determining top of rock, determining drilling methods, and determining hole diameter and bond length. The complete design, including design computations, fabrication and installation drawings and installation plan, shall be certified by a registered Professional Engineer and shall be submitted for approval. Approval of the design by the Contracting Officer will not relieve the Contractor of responsibility for design and performance of the rock anchors.

1.4.3 Rock Anchor Design

a) Rock Anchors - Design the individual anchors to meet the following criteria:

Anchor Location and Spacing - as shown on the drawings.
Hole Diameter - 4.5 inches minimum, 6 inches maximum.
Rock Anchor design Load - 128 kips.
Assumed Rock-Grout Bond Strength 83 psi.
Minimum Unbonded Length - 10 feet .
Minimum Required Bond Length - 15 feet for 6 inch diameter holes.
Maximum Bond Length - 35 feet.
Rock Anchor Corrosion Protection - Class I, Encapsulated Tendon.
Rock Anchor Angle of Anchor Inclination - 39 degrees (0.8 on 1 slope) from horizontal with a tolerance of ± 3 degrees.

The Design Load shall not exceed 60 percent of the ultimate strength of the prestressing steel. The Lock-off Load shall not exceed 70 percent of the ultimate strength of the prestressing steel. The maximum Test Load shall not exceed 80 percent of the ultimate strength of the prestressing steel. The designer should include consideration of group effect of closely spaced anchors when determining design load and minimum spacing. Design the bearing plates so that the bending stresses in the plate do not exceed the yield strength of the steel when a load equal to 95 percent of the minimum specified ultimate tensile strength of the prestressing steel is applied and so that the average bearing stress on the structure does not exceed 3500 psi. Design the anchorage assembly connection to the structure in accordance with AISC 325.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00.00 25 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication and Installation Drawings; G, A/E

Drawings and detailed installation procedures and sequences showing complete details of the installation procedure and equipment; anchor fabricationincluding detailed design of jackign wedge adn connection to wale and sheet pile; grouting methods; grout mix designs; anchor and casing placement and installation; corrosion protection for bond length, stressing length and anchorage; anchorage and trumpet; stressing and testing procedures with lengths, forces, deformations, and elongations for the approval by the Contracting Officer. Shop drawings for anchors shall include locations and details of the spacers, centralizers, and banding. If different types of anchors are to be installed, each anchor type shall be readily identifiable. Once reviewed by the Contracting Officer, no changes or deviation from shop drawings will be permitted without further review by the Contracting Officer.

SD-03 Product Data

Equipment; G, A/E

Catalog cuts, brochures, or other descriptive literature describing the equipment to be used for drilling, grouting, handling, and installing the rock anchors. Sketches, drawings or details showing the access and temporary supports where required for the drilling equipment and stressing frames. Descriptions of stressing jacks, gages, dynamometers, load cells, or other devices for measuring stressing load, certified calibration records for each set of jacking equipment, and current testing curves for stress measurement gages which show that gages have been calibrated for the jacks for which they are used 30 days prior to the start of the testing operations.

Designer Qualifications; G, A/E

Fabricator Qualifications; G, A/E

Installer Qualifications; G, A/E

Submit qualifications and experience records for approval. Experience records shall identify all the individuals responsible for the anchors and shall include a listing of projects of similar scope performed within the specified period along with points of contact. Submit Qualifications prior to the installation of any anchors specified in this section.

Installation Plan; G, A/E

A plan for installing the rock anchors for review and comment. The proposal shall describe the sequence for installation and other restrictions as outlined on the drawings or specified. The anchor and casing installation procedures shall be determined by the Contractor as part of the anchor design. The installation plan shall also include descriptions of methods and equipment to be used for alignment checking of anchor holes and casings.

SD-05 Design Data

Design Computations; G, A/E

Design computations and data for the rock anchors, bearing plates, and bond zones. The computations shall include drawings, design assumptions, calculations, and other information in sufficient detail to verify the design. The design shall be certified by a registered Professional Engineer with proven experience in design of rock anchor components as stated in paragraph Qualifications. Calculations shall be included for the stressing frames. The Contracting Officer will approve the Contractor's design calculations. Approval of the Contractor's design calculations will not relieve the Contractor of responsibility for unsatisfactory performance of the installed rock anchors. All design computations shall be furnished at least 30 calendar days prior to the proposed commencement of drilling.

Rock Anchor Design; G, A/E

A design schedule for the anchors which includes the following:

a. Anchor number.

b. Anchor orientation and angle.
c. Anchor design load.
d. Type and size of tendon.
e. Minimum total anchor length.
f. Minimum bond length.
g. Minimum tendon bond length
h. Minimum unbonded length.
i. Details of corrosion protection, including details of anchorage and installation

Submit the design schedule at least 30 days prior to commencement of work on the anchors covered by the schedule.

SD-06 Test Reports

Prestressing Steel; G, A/E

Certified test reports for each heat or lot of prestressing steel with materials delivered to the site.

Cement Grout Mixture Proportions; G, A/E

Performance Test Procedures; G, A/E

Proof Test Procedures; G, A/E

Lock-Off Procedures; G, A/E

The mixture proportions that will produce grout of the quality required, thirty days prior to installation of anchors. Applicable test reports to verify that the grout mixture proportions selected will produce grout of the quality specified.

SD-07 Certificates

Prestressing Steel; G, A/E

Five copies of mill reports and five copies of a certificate from the manufacturer stating chemical properties, ultimate strengths, yield strengths, modulus of elasticity, and any other physical properties needed for the required computations, for the type of steel furnished.

Epoxy-Coated Steel Bars; G, A/E

Written certification for coating material and coated bars with the delivery of the bars.

SD-11 Closeout Submittals

Driller Logs; G, A/E

The original handwritten log and three (3) copies in typed format within two days of the completion of each hole.

Anchor Records; G, A/E

Upon completion of installation of each anchor, top of bond zone elevation, bond length, free stressing length of anchor, grout

mix, grouting pressure, bags of cement injected, and a report of performance test or proof test and extended creep test results, . The performance test, proof test and extended creep test results shall include measured lengths of drill holes and anchors, the loads and elongations recorded during testing, monitoring and stressing of the anchors, and graphs of test results.

1.6 QUALITY ASSURANCE

Submit anchor designer, fabricator and installer qualifications for approval in accordance with paragraph SUBMITTALS.. The submittals shall, where applicable, identify individuals who will be working on this contract and their relevant experience. No changes shall be made in approved personnel without prior approval of the Contracting Officer.

1.6.1 Designer Qualifications

The anchors shall be designed by Professional Engineers who have designed a minimum three rock anchors projects similar in size and scope to this project within the past ten years. The drawings and calculations shall be signed by the Professional Engineer.

1.6.2 Fabricator Qualifications

The anchors shall be fabricated by a manufacturer that has been in the practice of designing and fabricating rock anchors similar in size and scope to this project for at least ten years.

1.6.3 Installer Qualifications

The anchors shall be installed by a firm which is regularly engaged in the installation of rock anchors and has at least five years experience in the installation of similar anchors. The superintendent shall have installed anchors on at least five projects of similar scope and size.

1.7 DELIVERY, STORAGE, AND HANDLING

Materials shall be suitably wrapped, packaged or covered at the factory or shop to prevent being affected by dirt, water, oil, grease, and rust. Protect materials against abrasion or damage during shipment and handling. Place materials stored at the site above ground on a well supported platform and covered with plastic or other approved material. Materials shall be protected from adjacent construction operations. Grounding of welding leads to prestressing steel will not be permitted. Reject and remove from the site prestressing steel which is damaged by abrasion, cuts, nicks, heavy corrosions, pitting, welds or weld spatter. Inspect tendons prior to insertion into anchor holes for damage to corrosion protection. Any such damage shall be repaired in a manner recommended by the tendon manufacturer and approved by the Contracting Officer.

1.8 SITE CONDITIONS

A foundation investigation has been made at the site by the Government and data is presented on the foundation exploration drawings. Subsurface soil data logs are shown on the drawings. Additional subsurface information is available in the geotechnical report, included in the bid documents or available from the contracting officer. While the foundation information is representative of subsurface conditions at the respective locations, local variations in the characteristics of the subsurface materials may be

anticipated. Local variations which may be encountered include, but are not limited to, classification and thickness of rock strata, fractures, and other discontinuities in the rock structure, and variation in the soil classifications. Such variations will not be considered as differing materially within the purview of the CONTRACT CLAUSES, paragraph Differing Site Conditions. Core from the borings indicated on the drawings are available for inspection as specified in the SPECIAL CONTRACT REQUIREMENTS, paragraph Physical Data. The Contractor is responsible for verifying the location of all utilities that may be affected by construction or the installation of the anchors.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Prestressing Steel

2.1.1.1 High-Strength Steel Bars

ASTM A 722, Type II, supplementary requirements S1,S2,S3 do not apply.

2.1.1.2 Epoxy-Coated Steel Bars

ASTM A 722, Type II, conforming to the coating requirements of ASTM A 775, 8 mils minimum thickness. Coating at the anchorage end may be omitted over the length provided for threading the nut against the bearing plate. Material handling shall be in accordance with ASTM A 775/A 775M, Appendix X1, Guidelines for Job-Site Practices.

2.1.2 Structural Steel

ASTM A 36/A 36M.

2.1.3 Steel Pipe

ASTM A 53, Type E or S, Grade B.

2.1.4 Steel Tube

ASTM A 500 or API Spec 5CT, Grade N-80, Oil Field Seconds / Mill Secondary Tubing.

2.1.5 Ductile Iron Castings

ASTM A 536.

2.1.6 Polyethylene Tubing

2.1.6.1 Smooth Polyethylene Tubing

ASTM D 3350 ASTM D 1248, Type III.

2.1.6.2 Corrugated Polyethylene Tubing

AASHTO M 252, with average minimum wall thickness of 0.06 inch.

2.1.7 Smooth Polypropylene Tubing

ASTM D 4101, designation PP 210 B5542-11.

2.1.8 Polyvinyl Chloride (PVC) Pipe

ASTM D 1785, Schedule 40.

2.1.9 Polyvinyl Chloride (PVC) Tubing

2.1.9.1 Smooth Polyvinyl Chloride (PVC) Tubing

ASTM D 1784.

2.1.9.2 Corrugated Polyvinyl Chloride (PVC) Tubing

Manufactured from rigid PVC compounds conforming to ASTM D 1784, Class 13464-8 with average minimum wall thickness of 0.04 inch.

2.1.10 Heat Shrinkable Sleeve

Radiation crosslinked polyolefin tube internally coated with and adhesive sealant.

2.1.11 Corrosion Inhibiting Compound

The corrosion inhibiting compound shall conform to the requirements of Section 3.2.5 of PTI 8.

2.2 MANUFACTURED UNITS

2.2.1 Anchor Head

Anchor head shall consist of steel bearing plate with nut for bar anchors, trumpet and corrosion protection. Anchorage devices shall be capable of developing 95 percent of the guaranteed ultimate strength of prestressing steel. The anchorage devices shall conform to the static strength requirements of Section 3.1.6 (1) and Section 3.1.8 (1) and (2) of PTI A. Wedges shall be designed to not cause premature failure of the prestressing steel due to notching or pinching. Threaded anchorage items for epoxy coated bars shall be designed to fit over the epoxy coating and maintain the capacity of the prestressing steel. The trumpet used to provide a transition from the anchorage to the unbonded length corrosion protection shall be fabricated from steel pipe or steel tube. The minimum wall thickness shall be 0.125 inch for diameters up to 4 inches and 0.20 inch for larger diameters. The trumpet shall be welded to the bearing plate.

2.2.2 Prestressing Steel Couplers

Prestressing steel couplers for bars shall be capable of developing 100 percent of the minimum specified ultimate tensile strength of the prestressing steel.

2.2.3 Centralizers and Spacers

Centralizers and spacers shall be fabricated from plastic, steel or other approved material which is nondetrimental to the prestressing steel. Wood shall not be used. The centralizer shall be able to support the tendon in the drill hole and position the tendon so a minimum of 0.5 inch of grout cover is provided. Centralizers and spacers shall permit grout to freely flow up the drill hole.

2.2.4 Casing

Casing shall be steel pipe or steel tube selected and sized by the Contractor where required. Casing shall be the necessary type and size to permit proper drilling of anchor holes and placing of anchors as specified herein and shown on the drawings. Straightening of casings and machining of joints may be necessary in order to meet specified alignment tolerances.

2.2.5 Anchorage Covers

Fabricate anchorage covers from steel or plastic. The material used shall not be subject to attack by cement, corrosion-inhibiting greases or the environment. If plastic is used, it shall not be susceptible to ultraviolet light degradation. Securely attach the cover to the bearing plate. If the cover is to be grease filled, the cover shall form a permanent watertight enclosure for the anchorage device.

2.3 EQUIPMENT

The Contractor's Quality Control manager shall verify that the equipment used on site is the same as the equipment submitted for approval.

2.3.1 Drilling Equipment

Provide drilling equipment suitable for advancing the drill tools to the depths and at the alignment required..

2.3.2 Grouting Equipment

2.3.2.1 Grout Mixer

The grout mixer shall be a high-speed, high-shear, colloidal type grout mixer capable of continuous mechanical mixing that will produce uniform and thoroughly mixed grout which is free of lumps and undispersed cement. The mixer shall be equipped with a suitable water and admixture measuring devices calibrated to read in cubic feet and tenths and so designed that after each delivery the hands can be conveniently set back to zero.

2.3.2.2 Grout Pump

The grout pump shall be of the positive displacement type, and shall be capable of pumping at all flow rates below 20 gpm, shall be capable of pumping at the pressure of at least 50 psi at zero flow rate. For neat cement grout, the pump shall have a screen with 0.125 inch maximum clearance to sieve the grout before being introduced into the pump. Screens are not required for shear type mixers. Make available a pump which is capable of pumping both neat cement grout mixes and sanded grout mixes. The pumping equipment shall have a pressure gage capable of measuring pressures of at least 150 psi or twice the required grout pressure, whichever is greater.

2.3.3 Stressing Equipment

Stressing equipment shall be hydraulically operated and shall have a capacity sufficient to stress the anchors to the required Test Loads within the rated capacity in one stroke. Pumps shall be capable of applying each load increment in less than 60 seconds and shall be capable of maintaining the hydraulic pressure within 50 psi. The equipment shall permit stressing of the tendon in increments and raising or lowering the load in the

tendon. The equipment shall be calibrated with an accuracy of ±2% and the calibration certificate and graphs shall be available at the site. The production gage shall have graduations of 100 psi or less. A second certified gage shall be maintained for periodic verification of the production gage. A dial gage or approved device shall be provided to measure total tendon elongation at each load increment to the nearest 0.001 inch. The dial gage shall be capable of measuring the entire anchor movement without being reset. Calibration of gages shall be verified no more than 30 calendar days prior to commencing work under this contract and at six-month intervals throughout the period of use.

2.3.4 Testing Equipment

Provide testing equipment consisting of a hydraulic jack with calibrated pressure gage for applying the load and a dial gage or vernier scale to measure anchor movement. The ram travel of the stressing equipment shall be not less than the theoretical elastic elongation of the total anchor length at the maximum Test Load. The pressure gage shall be graduated in 100 psi increments. The stressing equipment and pressure gage must have been calibrated as a unit no more than 30 calendar days prior to commencing work under this contract and at six-month intervals throughout the period of use. The movement measuring device shall have a minimum travel equal to the theoretical elastic elongation of the total anchor length at the maximum Test Load without resetting the device. An approved dial gage or vernier scale and stand shall be provided to measure movement of the structure.

2.4 GROUT

2.4.1 Cement

ASTM C 150, Type II.

2.4.2 Water

Provide fresh, clean, potable water free from injurious amounts of sewage, oil, acid, alkali, salts, or organic matter.

2.4.3 Aggregates

Fine aggregate for sand-cement grout shall conform to ACI 301 and ASTM C 33 for grout for backfilling holes or ASTM C 144 for grout for pregrouting. Aggregates shall not contain substances which may be deleterioulsy reactive with alkalies in the cement.

2.4.4 Admixtures.

Admixtures which control bleed, improve flowability, reduce water content and retard set may be used in the grout subject to the approval of the Contracting Officer. Any admixtures used shall be compatible with the prestressing steel and shall be mixed in accordance with the manufacturer's recommendations.

2.4.5 Grout for Anchors

2.4.5.1 Cement Grout

Cement grout mixture proportions are the responsibility of the Contractor. Grout for grouting anchors shall consist of a homogenous, pumpable, stable

mixture of portland cement and water. Submit the proposed mix design to the Contracting Officer for approval. The water content shall be the minimum necessary for proper placement but the water-cement ratio shall not exceed 0.45 by weight. Final proportions of materials shall be based on results of tests made on sample mixtures of grout. The minimum compressive strength of two-inch cubes, molded, cured, and tested in accordance with ASTM C 109, shall be 3,500 psi at the time of stressing. The Contractor is responsible for taking, curing, and breaking of grout test cubes for determining mix design, and all testing shall be done by an independent laboratory approved by the Contracting Officer. Rock conditions and temperatures shall be replicated in the curing process.

2.4.6 Sand-Cement Grout

Grout for waterproofing holes, grouting holes which fail the watertightness test, and for backfilling holes which are abandoned shall consist of a mixture of portland cement, masonry sand and water. The grout mix proportions are the responsibility of the Contractor. Submit the proposed mix design to the Contracting Officer for approval.. The water content shall be the minimum necessary for proper placement. Final proportions of materials shall be based on results of tests made on sample mixtures of grout. The minimum compressive strength of two-inch cubes, molded, cured, and tested in accordance with ASTM C 109, shall be 4,000 psi. The Contractor is responsible for taking, curing, and breaking of grout test cubes for determining mix design, and all testing shall be done by an independent laboratory approved by the Contracting Officer. Rock conditions and temperatures shall be replicated in the curing process.

2.4.7 Grout for Anchor Pads

Use nonshrink grout conforming to ASTM C 1107 for supporting bearing plates.

2.5 TENDON FABRICATION

2.5.1 General

Fabrication of the anchors shall be as recommended by the suppliers. Anchors shall be completely assembled with all centralizers, spacers, grout and vent tubes and corrosion protection prior to insertion into the hole. Fabricated anchors shall be protected, transported and stored in a manner to prevent contamination or damage to any components.

2.5.2 Tendon

All spacers for multiple element tendons shall be located as indicated on the approved shop drawings. Tendon material shall be unblemished and free of pitting, nicks, grease, or injurious defects. When required to maintain the tendon location within the hole, provide centralizers at a maximum of 10 foot intervals center-to-center throughout the bond length. Spacers shall be provided at a maximum 10 foot intervals center-to-center throughout the bond length. The entire bond length of the tendon shall be free of dirt, lubricants, loose rust, corrosion-inhibiting coatings or other contaminants.

2.5.3 Bond Breaker

Bond breaker for free stressing length of unbonded anchors shall consist of smooth polyethylene tubing, minimum wall thickness 0.04 inch, or smooth PVC tubing, minimum wall thickness 0.04 inch.

2.5.4 Vent Tubes

Vent tubes used during grouting operations, if necessary, shall be any appropriate type for the job, as recommended by the supplier of the anchors.

2.5.5 Grout Tubes

Grout tubes shall be polyethylene tubing or as recommended by the anchor manufacturer and approved by the Contracting Officer. Inside diameter of grout tubes shall be adequate to fully grout the entire hole.

2.5.6 Corrosion Protection

Corrosion protection shall be as indicated. Rock anchors at sheet pile wall shall be Class I corrosion protected. Corrosion protection shall be provided for the entire anchor and shall include anchorages covers and trumpets filled with corrosion inhibiting compound or grout and encapsulation of the free stressing length and bond length.

2.5.6.1 Anchorage Protection

The anchorage for rock anchors shall be completely encased into the new bulkhead pilecap concrete. A minimum concrete cover of 3 inches is required for all parts of the rock anchor anchorages.

2.5.6.2 Free Stressing Length Encapsulation

Encapsulation for free stressing length shall consist of a sheath of smooth polyethylene tubing, minimum wall thickness 0.06 inch; smooth polypropylene tubing, minimum wall thickness 0.06 inch; smooth PVC tubing, minimum wall thickness 0.04 inch; steel pipe or tube with minimum wall thickness 0.20 inch or corrugated tubing conforming to paragraph Bond Length Encapsulation. Sheath for bars may be heat shrinkable sleeve with a minimum thickness of 0.024 inch. Free stressing length encapsulation shall extend at least 4 inches into the trumpet, but shall not contact the bearing plate during testing and stressing of the tendon. Where corrugated tubing is used for sheath for unbonded anchors, a separate bond breaker shall be provided.

2.5.6.3 Bond Length Encapsulation

Bond length encapsulation for sheet pile wall rock anchors shall consist of corrugated polyethylene tubing, minimum wall thickness 0.060 inch or corrugated PVC tubing, minimum wall thickness 0.040 inch.

2.6 TESTS, INSPECTIONS, AND VERIFICATIONS

Perform required material tests, on prestressing steel and accessories, by an approved laboratory to demonstrate that the materials are in conformance with the specifications. Test grout in accordance with ASTM C 109. These tests shall be at the Contractor's expense. Furnish to the Contracting Officer prestressing steel test results prior to beginning fabrication of any anchors and within 24 hours of testing..

PART 3 EXECUTION

3.1 DRILLING HOLES

3.1.1 General

The physical conditions indicated on the drawings are the result of soil sampling and core borings. Holes shall be drilled at the locations and inclinations shown and to the depths and diameters determined by the Contractor to provide the design bond length and capacity indicated on the drawings. The locations of the holes may be changed only as approved by the Contracting Officer. Any redesign of the anchored structure due to relocation of anchor holes shall be performed by the Contractor. Unless otherwise specified, the Contractor shall determine the drilling method to be used. No holes shall be drilled within 20 feet of a grouted hole until the grout has set at least 24 hours. Care shall be taken while drilling to avoid damage of any kind to the existing structures. Damages of any nature will be evaluated by the Contracting Officer and repairs or replacements shall be made by the Contractor as required. Holes shall be drilled a maximum of 3 feet beyond the required anchor bond length. Provide a temporary plug for all holes drilled more than 10 days prior to installation of the anchor. Waste water from drilling operations shall be collected and recycled or treated; it shall not be discharged directly into the water or on the ground.

3.1.2 Drilling Through Existing Structures

Holes through existing structure shall be drilled by any method which does not cause damage to the surrounding structure. The Contractor is advised that foreign material, including metals and other materials remaining from original construction of the existing structure, may be encountered during drilling through existing structures.

3.1.3 Drilling In Soil

Holes in soil may be drilled by rotary drilling, rotary percussive, or vibratory driven casing. Holes in soil shall be provided with steel casing where required for support of the surrounding material. Casing shall be removed during anchor grouting. Where soil is susceptible to caving, holes through soil shall be drilled by the duplex method using an inner and outer casing with return water flow between the casings.

3.1.4 Casing

Casing shall be utilized for drilling through unstable soil formations and through existing structures. The casing shall be advanced by rotary drilling.

3.1.5 Drilling in Rock

Unless otherwise specified, holes in rock may be drilled by core drilling, rotary drilling using equipment suitable for the intended purpose. The drilling method shall not cause structural damage to existing structures. If damage is observed, the drilling method shall be modified. Overdrilling of holes by a maximum of three feet beyond the required elevation will be permitted if complete removal of cuttings and other material cannot be accomplished. If the hole is overdrilled, the tendon must be supported so that the free length corrosion protection extends the required length into the trumpet and so that the anchor can be stressed.

3.1.6 Records

Submit driller logs and records as specified in paragraph Driller Logs. The presence of a Government inspector or the keeping of separate drilling records by the Contracting Officer shall not relieve the Contractor of the responsibility for the work specified in this paragraph. Payment will not be made for any work for which the required records have not been furnished by the Contractor.

3.1.7 Alignment

3.1.7.1 Tolerances

The anchor hole shall be located within 1 foot of the plan location, however spacing between any two adjacent anchors shall not exceed 14 feet. Locations for the northernmost and southernomst anchors shall not exceed the offset values from the end of the wall as indicated on the drawings. The entry angle shall be within 3 degrees of the specified inclination. The alignment of the drilled hole shall be within 3 degrees of the theoretical alignment. If the hole alignment is not within these tolerances, the hole shall be backfilled with cement or sand-cement grout and a new hole drilled adjacent to the rejected hole.

3.1.8 Watertightness Testing

The rock portion of all drilled holes shall be watertightness tested in accordance with the procedures of PTI 4, paragraph 7.4. A packer shall be used where necessary to facilitate pressure testing of the bond zone. Holes which have a water loss in excess of 2.5 gallons in ten minutes shall be grouted as specified in paragraph Waterproofing Anchor Holes, and redrilled.

3.1.9 Waterproofing Anchor Holes

The rock portion of anchor holes which fail the watertightness test shall be pressure grouted with cement grout as specified in paragraph Grout for Waterproofing or Backfilling Holes. Grouted holes shall be redrilled while the grout strength is considerably less than that of the surrounding rock, but not less than 18 hours after grouting.

3.2 INSTALLATION OF ANCHORS

3.2.1 General

The Contractor is responsible for each drilled hole until the anchor has been installed, grouted, stressed and accepted. Holes in rock and casings shall be cleaned by pressurized air and/or water to remove drill cuttings and mud. The anchors designated as demonstration test anchors shall be installed and tested prior to drilling the bond zone for other anchors within the area represented by the demonstration test anchor.

3.2.2 Placing

All the equipment used in handling and placing the anchors shall be such that it does not damage or deteriorate the prestressing steel, corrosion protection, or the anchorages. Each anchor shall be inspected prior to insertion into the hole. Any damage to corrosion protection shall be repaired prior to insertion or, if determined by the Contracting Officer to

be not repairable, the anchor shall be replaced. Insertion of anchors shall be in accordance with PTI 4.

3.2.3 Cement Grouted Rock Anchors

Grouting equipment shall be of type and capacity required for successful installation of the rock anchors. All anchors shall use single stage grouting to encase the anchor. Grouting shall be performed by a method in accordance with PTI 4, paragraph 7.6. Grouting shall commence at the bottom of the grout zone and proceed to the top of the zone. Grouting shall be gravity flow. The casing shall be withdrawn as the grouting proceeds.

3.3 STRESSING

3.3.1 General Requirements

After the anchor grout in the bond zone has reached sufficient strength in accordance with the Contractor's design, as verified by grout cube break, the rock anchors shall be stressed. Prior to stressing, surfaces upon which the stressing equipment is resting must be clean and the stressing equipment shall be aligned as nearly with the center of the hole as possible. Provide adequate compacted backfill or shoring in vicinity of rock anchors during all test adn lock-off operations to limit lateral movement of AZ-18 steel sheets and existing bulkhead structure. An Alignment Load of 10 percent of the Design Load shall be applied to the anchor prior to setting dial gauges. Stress the anchor in accordance with the anchor manufacturer's recommendation, subject to the approval of the Contracting Officer. Design and Lock-off loads are given on the drawings. Determine the lock-off procedure so that the lift-off results meet the acceptance criteria specified in paragraph Acceptance. The maximum stress shall never exceed 80 percent of the guaranteed ultimate strength of anchor steel. The process of stressing the anchors shall be so conducted that accurate elongation of the anchor steel can at all times be recorded and compared with the computations submitted to, and accepted by the Contracting Officer. Safety precautions shall be taken to prevent workers from being behind or in front of the stressing equipment during stressing. Stressing of the anchors shall be performed in a sequence submitted by the Contractor for review by the Contracting Officer. Two adjacent anchors shall be in place before anchor stressing can occur. All stressing shall be done in the presence of a representative of the Contracting Officer. At no time during the stressing and testing of an anchor shall the stressing equipment be disconnected from the temporary stressing head or anchor. Each anchor to be performance tested shall be declared acceptable before proceeding with drilling for other production anchors within the section represented by that anchor.

3.3.2 Lock-off

After completion of the all required tests, the load shall be returned to the Alignment Load and the specified Lock-off Load shall be applied to the anchor. A lift-off test shall be made to verify the load in the anchor tendon before the tendon is locked-off and the stressing equipment is removed. The lift-off reading shall be within five percent of the specified lock-off load. If the lift-off reading is not within five percent of the specified lock-off load, the anchorage shall be reset and another lift-off reading shall be made. This procedure shall be repeated until a satisfactory lift-off reading is obtained. After lock-off, the trumpet shall be filled with grout and the anchorage recess shall be fully

grouted flush with the adjacent surfaces.

3.4 FIELD QUALITY CONTROL

3.4.1 General

All Rock Anchors shall be tested in accordance with the testing notes, frequency, schedule, and loading sequence provided on the drawings. Additional descriptions are provided in the paragraphs below.

Rock Anchors - The first two anchors and a minimum of 2 of the remaining anchors shall be designated as demonstration test anchors. Designated demonstration test anchors shall be used to verify top of rock elevation, rock quality and the adequacy of the Contractor's anchor design and installation procedures. Demonstration test anchors shall pass the performance test prior to placing other anchors within the section represented by the respective demonstration test anchor. All other rock anchors shall be proof tested. During the stressing of each anchor, a record shall be kept of gage pressure and of anchor elongation at each stage of stressing to the specified test or Lock-off Load, as applicable. The Test Load shall not be exceeded. Provide a qualified professional engineer to evaluate the anchor test results and determine the acceptability of the anchors in accordance with the criteria indicated hereunder. Final acceptance of each anchor will be made by the Contracting Officer. All tests shall be run in the presence of the Contracting Officer or his representative. All remaining rock anchors shall be proof tested and locked off at 50% of the design load.

3.4.2 Performance Test

Performance test shall consist of cyclically and incrementally loading and unloading the anchor, and shall be conducted in accordance with PTI 4, Paragraph 8.3.2, and in accordance with the anchor testing notes provided on the drawings. During the testing of each anchor, a record shall be kept of gage pressure and of anchor elongation at each stage of stressing to each Test Load required by PTI 4. Measurements of the elongation of prestressing steel shall be made in accordance with PTI 4. If the total movement at the end of 10 minutes at the Test Load exceeds 0.040 inch, the Test Load shall be held an additional 50 minutes and the movement readings shall be taken at the interval specified in PTI 4, Paragraph 8.3.2. Test records, including plots and graphical analysis of test data, shall be furnished upon acceptance of each performance tested anchor in accordance with paragraph SUBMITTALS.

3.4.3 Proof Test

Proof test shall consist of incrementally loading the anchor and shall be conducted in accordance with PTI 4, Paragraph 8.3.3, and in accordance with the anchor testing notes provided on the drawings. During the testing of each anchor, a record shall be kept of gage pressure and of anchor elongation at each stage of stressing to the Test Load required by PTI 4. Measurements of the elongation of prestressing steel shall be made in accordance with PTI 4. If the total movement at the end of 10 minutes at the Test Load exceeds 0.040 inch, the Test Load shall be held an additional 50 minutes and the movement readings shall be taken at the interval specified in PTI 4, Paragraph 8.3.3. Test records, including plots and graphical analysis of test data, shall be furnished upon acceptance of each proof tested anchor in accordance with paragraph SUBMITTALS. The proof test results shall be compared with similar anchors in which performance

tests have been performed. If any significant variation from the proof tests occurs, the Contracting Officer may require additional performance tests.

3.4.4 Supplementary Extended Creep Test

Where specified, anchors shall have an extended creep test performed. Creep test shall consist of cyclically and incrementally loading and unloading the anchor, and shall be conducted in accordance with PTI 4, Paragraph 8.3.4. Each maximum load shall be held in accordance with PTI A, Table 8.3.4. A plot of each family of creep curves shall be submitted along with the recorded readings taken at time of the test.

3.4.5 Driller Logs

The QC Manager shall Keep accurate driller logs and records of all work accomplished under this contract and shall deliver complete, legible copies of these logs and records to the Contracting Officer upon completion of the work or at such other time or times as he may be directed. All such records shall be preserved in good condition and order by the Contractor until they are delivered and accepted, and the Contracting Officer shall have the right to examine such records at any time prior to their delivery. Separate logs shall be made for each hole. The Contractor shall use DRILLING LOG, ENG FORM 1836 and 1836A or other approved form which provides the required information for his logs. The following information shall be included on the logs or in the records for each hole:

a. Hole number or designation and elevation of top of hole.

b. Inclination of the hole.

c. Make and manufacturer's model designation of drilling equipment.

d. Dates and time when drilling operations were performed.

e. Time required for drilling each run.

f. Elevation of top of rock.

g. Steel casing seat elevation.

h. Depths and elevations at which core was recovered or attempts made to core including top and bottom depth of each run.

i. Geologic classification or description by depths of each stratigraphic unit cored. This classification or description shall be made immediately following the taking of the core.

j. Percentage of core recovered and rock quality designation per run.

k. Depth and elevation of rod drops and other unusual occurrences.

l. Depth and elevation at which groundwater is encountered.

m. Depths and elevations at which drill water is lost and regained and amounts.

n. Depth and elevation of bottom of hole, determined by measuring the drill steel length.

3.4.6 Anchor Records

Upon completion of installation of each anchors, the anchor records shall be furnished to the Contracting Officer as specified in paragraph SUBMITTALS. In addition as-built drawings showing the completed installation of the anchors shall be furnished upon completion of installation of all anchors.

3.5 ACCEPTANCE

3.5.1 General

Acceptance of anchors shall be determined by the Contracting Officer. The following criteria will be used in determination of the acceptability of each anchor:

a. Creep - Creep movement shall not exceed 0.040 inch at maximum Test Load during the first 10 minutes of the performance or proof test. If the creep movement exceeds this limit, it shall not exceed 0.080 inch at the maximum Test Load at the end of 60 minutes. If the creep movement exceeds 0.080 inch at the maximum Test Load at the end of 60 minutes, the anchor shall be rejected.

b. Movement - Apparent free length shall be calculated from the observed elastic movement in accordance with PTI 4, Section 8.3.2.

1. Minimum Apparent Free Length - The calculated free length shall be not less than 80 percent of the designed free tendon length plus the jack length. If the anchor does not meet this criteria, the anchor shall be restressed from the Alignment Load to the Test Load and the apparent free length shall be recalculated. If the anchor does not meet this criteria after 3 attempts (original plus 2 restresses), the anchor shall be rejected.

2. Maximum Apparent Free Length - The calculated free length shall be not more than 100 percent of the designed free tendon length plus 50 percent of the bond length plus the jack length. If the anchor does not meet this criteria, and the cause of the behavior is not investigated and explained to the satisfaction of the Contracting Officer, the anchor shall be rejected.

c. Initial Lift-Off Reading - The initial lift-off reading shall be within 5 percent of the specified Lock-off Load. If the anchor does not meet this criteria, the anchor shall be adjusted as necessary and the lift-off reading shall be repeated.

3.5.2 Replacement of Rejected Anchors

Any anchor that fails the performance or proof test or is rejected by the Contracting Officer shall be replaced. A replacement anchor, including a new anchor hole, shall be provided by the Contractor at no expense to the Government. The location of the replacement anchor shall be as determined by the Contractor in accordance with the redesign of the anchored structure. Provide all materials, supplies, equipment, and labor necessary to provide a new anchor assembly to the satisfaction of the Contracting Officer. No drilling shall be performed for a replacement anchor until the grouting of all rock anchors within 20 feet of the replacement anchor

location has been allowed to set for at least 24 hours. Payment will not be made for rejected or failed anchors. The Contractor shall either remove failed anchors and thoroughly ream and clear the anchor hole or remove the load and cut the anchor and casing flush.

-- End of Section --

SECTION 05 12 00

STRUCTURAL STEEL
05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2005) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
ANSI/AISC 360	(2005) Specification for Structural Steel Buildings, with Commentary

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2007) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2010) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM C 1107/C 1107M	(2008) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 827	(2001a; R 2005) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
ASTM F 844	(2007a) Washers, Steel, Plain (Flat), Unhardened for General Use

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

1.2 SYSTEM DESCRIPTION

Provide the structural steel system, complete and ready for use.

Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing shall be provided in accordance with ANSI/AISC 360 except as modified in this contract.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00.00 25 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Erection Plan, including description of temporary supports; G, A/E

Fabrication drawings including description of connections; G, A/E

SD-03 Product Data

Welding electrodes and rods; G, A/E

Non-Shrink Grout; G, A/E

SD-06 Test Reports

Field Quality Control; G, A/E

Bolts, nuts, and washers; G, A/E

Supply the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

SD-07 Certificates

Steel; G, A/E

Bolts, nuts, and washers; G, A/E

Welding procedures and qualifications; G, A/E

1.4 QUALITY ASSURANCE

1.4.1 Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326 and AISC 325. Fabrication drawings shall not be reproductions of contract drawings. Sign and seal fabrication drawings by a professional engineer registered in the State where the project is located. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Double connections that require an erection seat to comply with OSHA 1926.756(c)(1) shall be shown on the shop drawings, reviewed and approved by the structural engineer of record. Use AWS A2.4 standard welding symbols. Shoring and temporary bracing shall be designed and

sealed by a registered professional engineer and submitted for record purposes, with calculations, as part of the drawings. Member substitutions of details shown on the contract drawings shall be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.4.2 Certifications

1.4.2.1 Erection Plan

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing.

1.4.2.2 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.1 STEEL

2.1.1 Structural Steel

ASTM A 36/A 36M.

2.2 BOLTS, NUTS, AND WASHERS

Provide the following unless indicated otherwise.

2.2.1 Structural Steel

2.2.1.1 Bolts

ASTM A 307, Grade A. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.2.1.2 Nuts

ASTM A 563, Grade and Style for applicable ASTM bolt standard recommended.

2.2.1.3 Washers

ASTM F 844 washers for ASTM A 307 bolts.

2.3 STRUCTURAL STEEL ACCESSORIES

2.3.1 Welding Electrodes and Rods

AWS D1.1/D1.1M.

2.3.2 Non-Shrink Grout

ASTM C 1107/C 1107M, with no ASTM C 827 shrinkage. Grout shall be nonmetallic.

2.4 FABRICATION

2.4.1 Markings

Prior to erection, members shall be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.

2.4.2 Cleaning

SSPC SP 6/NACE No.3. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

3.2 INSTALLATION

3.3 ERECTION

a. Erection of structural steel, shall be in accordance with the applicable provisions of AISC 325. Erection plan shall be reviewed, stamped and sealed by a licensed structural engineer.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.3.1 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.4 CONNECTIONS

Except as modified in this section, connections not detailed shall be designed in accordance with ANSI/AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member. Holes shall not be cut or enlarged by burning. Bolts, nuts, and washers shall be clean of dirt and rust, and lubricated

immediately prior to installation.

3.4.1 Common Grade Bolts

ASTM A 307 bolts shall be tightened to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.5 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.6 WELDING

AWS D1.1/D1.1M. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

The Contractor shall develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified shall be submitted for approval.

3.6.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Remove only from finished areas.

3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. Submit qualty assurance plan nd record of all tests and inspection. The Contracting Officer shall be notified in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of weld inspection.

3.7.1 Welds

3.7.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. Welding inspectors shall visually inspect and mark welds, including fillet weld end returns.

3.7.1.2 Nondestructive Testing

AWS D1.1/D1.1M. Test locations shall be selected by the Contracting Officer. If more than 20 percent of welds made by a welder contain defects identified by testing, then all welds made by that welder shall be tested by radiographic or ultrasonic testing, as approved by the Contracting Officer. When all welds made by an individual welder are required to be tested, magnetic particle testing shall be used only in areas inaccessible to either radiographic or ultrasonic testing. Retest defective areas after repair.

Testing frequency: Provide the following types and number of tests:

Test Type	Number of Tests
Magnetic Particle	10
Dye Penetrant	10

-- End of Section --

Addendum Acknowledgment Page

All Bidders shall Acknowledge receipt and acceptance of the following addendums

Addendum No. 1: _____
Signature

Addendum No 2: _____
Signature

Addendum No 3: _____
Signature

Addendum No 4: _____
Signature

Addendum No 5: _____
Signature

_____
Name of Business

Buds submitted without this acknowledgement may be considered non-responsive

ENVIRONMENTAL CONSULTING
GEOTECHNICAL ENGINEERING
MATERIALS TESTING
THRESHOLD INSPECTION
DRILLING SERVICES

NODARSE
& ASSOCIATES, INC.

August 18, 2010 **DRAFT**
Revised October 6, 2010

Mr. George N. Gray, P.E
Appledore Marine Engineering, Inc.
600 State Street, Suite E
Portsmouth, NH 03801
Phone: (603) 766-1870
Fax: (603) 766-4599

Re: Final Report of Geotechnical Engineering Services
Key West Naval Air Station (Breakwater 497)
Truman Annex, Key West, Florida
N&A Project No. 08-09-0021-102

Dear Mr. Gray:

Nodarse & Associates, Inc. (N&A) is pleased to present our final report of geotechnical engineering services for the proposed above referenced project in Key West, Monroe County, Florida. The initial geotechnical services were performed in accordance with our proposal number 08-09-0021-101 dated May 12, 2009. This final report was performed in accordance with our proposal number 08-09-0021-102 dated January 13, 2010.

N&A appreciates being of service to Appledore Marine Engineering, Inc. If you have any questions regarding the contents of this report, please contact us at (305) 820-1997.

Yours sincerely,
Nodarse & Associates, Inc.

Julio De Blas, P.E
Geotechnical Engineer
Florida License No. 64653

Hugo E. Soto, P.E.
Senior Geotechnical Engineer
Florida License No. 36440

cc: Addressee (1)
File (1)

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APPENDIX A

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APPENDIX B

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APPENDIX C

Case I – Cantilever Steel Sheet Wall Analysis and CWALSTH Input and Output Files – Surcharge 250 psf
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1.0 PROJECT INFORMATION

The project is located within the Truman Annex at the Key West Naval Air Station in Key West, Monroe County, Florida. The general site location is presented in the USGS map on **Figure 1** of **Appendix A**. From our review of Appledore Marine's Facility Assessment Report (Appledore Project no. 5024Z dated April 1, 2009) and the 60% design submission plans, we understand that the project consists of the partial replacement of the existing bulkhead wall (breakwater 497) with a new steel sheet pile wall. The existing wall is about 1,646 feet long with a top elevation of about 7.76 feet and consists of a steel sheet pile with an upper concrete encasement and tie rods at about elevation -3 feet. From station 0+00 to 12+90, the mud line was found ranging from elevation +7 to -3 feet and from station 12+90 to 16+46 it was found ranging from -3 to -16 feet.

As we understand it, the existing substructure is in poor condition (e.g. corrosion holes and deck settlement due to the sheet pile wall condition). The recommendations call for installing a new steel sheet pile wall outboard of the existing one and filling the gap between the old and new wall with crushed stone fill. Three (3) options/concepts are being considered: steel sheet pile with anchors socketed into the limestone formation (Concept A), cantilever steel sheet pile (Concept B), and deadman anchored steel sheet pile (Concept C).

The rock coring program included in this final geotechnical report was performed in order to support the evaluation of concepts A and B (steel sheet pile wall anchored into the natural limestone formation and cantilever steel sheet pile wall, respectively).

2.0 SCOPE OF WORK

Our initial geotechnical services consisted of performing a subsurface exploration consisting of three (3) Standard Penetration Test (SPT) borings along the damaged bulkhead wall. The SPT borings were used to determine the subsurface conditions along the bulkhead wall and to provide geotechnical engineering recommendations in order to repair or replace the existing bulkhead wall. The initial services were performed between September 15 and 18, 2009. A preliminary geotechnical engineering report was submitted on December 1, 2009.

For the final design phase of the project, a rock coring program to better determine the rock strength characteristics of the natural limestone formation was performed. The rock coring program was performed between July 27 and July 30, 2010. The rock coring program consisted of performing 4-inch diameter rock coring as close as possible to each of the three (3) SPT locations previously performed in order to correlate the results with the SPT findings and to support the evaluation of concepts A and B. The rock coring was performed at three (3) locations from approximately the depth of 28 to 48 feet below existing ground surface (approximately elevation -22.0 to -42.0 feet, NAVD88). At location TB-1, the coring was extended from 48 to 53 feet below the existing ground surface (approximately elevation -42.0 to -47.0 feet, NAVD88).In addition, Ground Penetrating Radar (GPR) was performed by N&A's sub-consultant Wingerter Laboratories, Inc. The results of the GPR services are presented under a different report cover.

3.0 FIELD EXPLORATION

3.1 General

N&A conducted a field exploration program consisting of three (3) Standard Penetration Test (SPT) borings (TB-1 through TB-3) to depths varying from 75 to 90 feet below the existing ground surface. The tests were performed between September 15 and 18, 2009. The SPT borings were performed using a light hydraulic mini rig using rotary drilling procedures. The tests were located in the field by others.

The rock coring program was performed about 1 to 2 feet from the previously performed SPT borings (except location TB-2 which was performed about 25 feet away from SPT boring location due to possible unsafe ground conditions given the weight of the drill-rig) in order to correlate the rock coring results with the SPT findings and in order to avoid underground utility conflicts. The rock coring program was performed between July 27 and July 30, 2010. The light hydraulic mini rig previously used for the SPT boring locations could not be used to perform the rock coring. It was initially proposed to perform the rock coring farther away from the wall but as close as possible to the SPT boring locations given the deteriorating conditions of the wall. Nonetheless, given the multiple underground utilities that exist at the site, it was decided to perform the rock coring adjacent to the SPT borings where is clear of underground utilities. The approximate location of the borings/rock coring is presented in **Figure 2** of **Appendix A**.

3.2 Standard Penetration Test (SPT) Borings

Standard Penetration Test (SPT) borings were performed using the techniques of ASTM D-1586. After seating the sampler six (6) inches, the number of successive blows required to drive the sampler twelve (12) inches into the soil constitutes the test result commonly referred to as the "N" value. The “N” value has been empirically correlated with various soil properties and is considered to be indicative of the relative density of cohensionless soils and the consistency of cohesive soils. The SPT borings were performed using a hydraulic mini rig equipped with a safety hammer. The recovered split spoon samples were visually classified in the field and placed in sealed containers and transported to the laboratory for further review. The soil profiles are presented in **Figure 3** of **Appendix A**.

3.3 Rock Coring

Sixty-five (65) feet of rock coring was performed for the project: twenty-five (25) feet at location TB-1, and twenty (20) feet at each location TB-2 and TB-3. The rock coring program was performed using a 4-inch conventional core barrel. Five (5) foot runs were recovered and placed in boxes. The length of each individual coring was 5 feet. The cores were removed carefully from the barrel and were placed in core boxes equipped with longitudinal separators. Spacer blocks were marked with core run and depth and inserted into the core column to indicate the beginning and end of each core run.

Core recoveries were calculated for each run, which is defined as the total length of core recovered from the hole as a percentage of the total length of rock drilled during the coring run. In addition, the Rock Quality Designation (RQD) for each rock core sample was determined. The RQD is defined as the sum total length of all pieces of core exceeding 4 inches as a percentage of the total length of rock drilled during coring run. The RQD value is intended to reflect the in-situ fracture characteristics of the rock. The rock recovery, RQD, and coring time information is included in the Soil/Rock Profiles presented in **Figure 3** of **Appendix A**.

4.0 LABORATORY TESTING

4.1 General

Representative samples collected from the test boring locations were visually reviewed in the laboratory by a geotechnical engineer to confirm the field classifications. The samples were classified using the Unified Soil Classification System (USCS) in general accordance with the American Society of Testing and Materials (ASTM) test designation D 2487. The soil classification was based on visual observations only. In addition, no corrosion (environmental) laboratory tests were performed. However, given the proximity of the site to the ocean (marine environment), we recommend an Extremely Aggressive (EA) environmental classification for the superstructure and substructure in accordance with FDOT Structure Design Guidelines. Rock strength testing was performed on representative samples recovered from the field activities.

4.2 Rock Strength Testing

Strength tests were performed in the laboratory on the rock core specimens recovered from the rock coring program for of this project. The strength testing performed included unconfined compression (in accordance with ASTM Test Designation D-2938-86) and splitting tensile (in accordance with ASTM Test Designation D-3967-86). In addition, unit weight determination was made of the selected rock core samples. The test results obtained are presented in the Soil/Rock Profiles presented in **Figure 3** of **Appendix A**. and in **Table 1** of **Appendix B**.

5.0 SUBSURFACE AND GROUNDWATER CONDITIONS

5.1 General Subsurface Conditions

The general subsurface conditions disclosed by the SPT borings are presented in **Figure 3** in **Appendix A** and generalized in **Table A** below:

Table A: General Subsurface Soil Conditions

Bottom Depth Range (ft)	"N_{safety}" Range (bpf)	General Soil Description	Unified Soil Classification System
-	-	Asphaltic Concrete (Thickness ranges from 1 to 2 inches)	-
-	-	Concrete (Thickness ranges from 5 to 6 inches)	-
10	4 - 14	Light Brown to Brown LIMEROCK with Slightly Silty Medium to Coarse Sand, Some Shell (Fill)	GP, GP-GM
28.5-30	3 - 8	Gray to Light Brown Medium to Coarse SAND with Few to Some Shell and Limestone Fragments	SP
75-90	14 - 50/0"	Light Brown LIMESTONE with Slightly Silty Fine Sand	-

5.2 Groundwater Conditions

During the initial subsurface exploration (between September 15 and 18, 2009), the groundwater was found at depths ranging from 3.0 to 3.3 feet with an average depth of 3.1 feet below the existing ground surface (elevation 3.2 feet, NAVD88). During the rock coring program (between July 27 and July 30, 2010), the groundwater was found at depths ranging from 5.0 to 5.5 feet with an average depth of 5.3 feet below the existing ground surface (elevation 1 foot, NAVD88). Fluctuations in the groundwater level should be expected principally due to tidal conditions and other construction activities.

5.3 General Geotechnical Design Parameters

The following geotechnical parameters were obtained by using empirically established relationships between the SPT "N" values with various soil properties. The limestone geotechnical parameters were obtained from rock coring program, laboratory testing and the rock shear strength relationship proposed by McVay and Townsend (1992). The geotechnical design parameters were used for lateral support system design evaluation (i.e. sheet piles). The general geotechnical soil parameters are presented in the following **Table B.**

Table B: Recommended Geotechnical Design Parameters

General Strata Description	Bottom Depth Range (ft)	Average "N_{safety}" (bpf)	Unit Weight (γ) (pcf)			Soil Friction Angle (ϕ) (deg)	Steel Wall Friction Angle (δ) (deg)	Side Shear Strength (psf)	Adhesion (psf)
			γ_{sat}	γ_{wet}	γ'				
Fill (Stratum 1)	10	9	115	110	53	34	22	-	0
Sand (Stratum 2)	28.5-30	6	110	105	48	32	17	-	0
Limestone (Stratum 3)	75-90	50/3"	125	[2] 120	63	-	-	[1] 12,000	0

Notes: [1] Derived from rock core test results presented in Appendix B and report section 5.3.1 and corresponds to the design ultimate unit side shear strength $[f_{su\ (design)}]$.

[2] Derived from unit weight results presented in Appendix B and corresponds to the 'modified' limestone wet unit weight.

5.3.1 Rock Side Shear Strength Derivation

The ultimate side shear strength (f_{su}) value of the natural limestone formation was obtained from results of laboratory strength testing using established empirical correlations. The ultimate side shear strength (f_{su}) value of the limestone formation was evaluated using the relationship proposed by McVay and Townsend (1992) and recommended as the most appropriate method for the Florida Limestones [Florida Department of Transporation Soils and Foundation Handbook (SFH), 2009, Appendix A]. The limestone ultimate side shear resistance is expressed as follows:

$$f_{su} = \frac{1}{2} * \sqrt{q_u} * \sqrt{q_t}$$

Where: q_u: Average unconfined compressive strength of the rock specimen based on statistical analyses suggested by the FDOT's SFH (2009) and

q_t: Average splitting tensile strength of the rock specimen based on statistical analyses suggested by the FDOT's SFH (2009)

The above equation is applicable to intact rock specimens (i.e. percent recovery = 100%). The rock coring recoveries from the field exploration program ranged from 20 to 100 percent with a statistical average of 48.5 percent. The Rock Quality Designation (RQD) values ranged from 0 to 45 percent with a statistical average of 9.2 percent. According to research by Deere et. al., RQD values ranging from 25 to 50 percent are representative of poor rock conditions. Therefore, we recommend calculating the ultimate side shear as the average of the modified mean and lower bound values (see Table 2 of Appendix B) instead of using the modified mean side shear value. The resulting ultimate side shear also correlates well with the initially used empirical correlation suggested by the FDOT SFH (2009).

The previous equation was modified to take into account the percent recovery of the rock at this site as follows:

$$f_{su} = \frac{1}{2} * \sqrt{q_u} * \sqrt{q_t} = 12.6 \text{ tsf}$$

$$f_{su(DESIGN)} = \%REC * f_{su} = \%REC * \left(\frac{1}{2} * \sqrt{q_u} * \sqrt{q_t} \right) = 0.485*12.6 = 6.1 \text{ tsf}$$

q_u average	=	793.75 psi
q_t average	=	154.86 psi
% recovery average	=	48.5%

The use of the above values and the previous equation yields an average design side shear strength [$f_{su\,(design)}$] of about 6 tons per square foot (tsf). This is considered a global $f_{su\,(design)}$ value as it is based on all rock recoveries from the three locations. This value is consistent with results obtained from the Florida Limestone in other projects and our local experience.

6.0 ENGINEERING RECOMMENDATIONS

We understand that several options/concepts are being considered to replace/repair the existing bulkead wall. These options considered are as follows:

1. Steel sheet pile with anchors socketed into the limestone formation (Concept A)
2. Cantilever steel sheet pile (Concept B)
3. Deadman anchored steel sheet pile (Concept C)

6.1 Steel Sheet Pile with Anchors Socketed into the Limestone Formation (Concept A)

We understand that a 1-1/4" diameter post-tensioned anchor bar (e.g. Dywidag bar anchors) at a 1:0.8 (H:V) slope with a bonding zone of about 5 inches in diameter is being evaluated to laterally support the new bulkhead wall. We understand that the required uplift anchor capacity is 144 kips (72 tons). A factor of safety of 2.0 was used for the anchor socket/bonding length calculations. The required rock socket/bonding length in order to achieve 144 kips of uplift capacity is noted in **Table C** below:

Table C: Recommendations for Drilled Anchors into the Limestone Formation

Design Criteria for Rock Anchors		Installation Criteria for 1-1/4" dia. Anchor		
Bond Stress Between Grout and Rock (tsf)	**Rock Cone Failure Angle (degrees)**	**Estimated Diameter of Bonding Zone (inches)**	**Minimum Rock Socket/Bonding Length (feet)**	**Allowable Uplift Capacity (Tons)**
6.0	30	5	18	72

The steel sheet pile wall and soil modeling, assumptions, CWALSHT input/output files and calculations are the same as Case IV (anchored sheet pile wall with 600 psf surcharge) presented in **Appendix C**.

6.2 Cantilever and Deadman Anchored Steel Sheet Pile Walls (Concepts B and C, respectively)

We understand that a cantilever or deadman steel sheet pile wall system is being considered to replace the existing bullhead wall. As requested, we have performed steel sheet pile wall analyses using the USACE software CWALSHT for the following cases:

Case I: Cantilever sheet pile wall with 250 psf surcharge
Case II: Cantilever sheet pile wall with 600 psf surcharge
Case III: Cantilever sheet pile wall with 8000 lbs point load
Case IV: Anchored sheet pile wall with 600 psf surcharge

Our sheet pile wall analyses assumed a water differential of 2 feet between the inside and outside face of the wall. Following the recommendations from Naval Facilities Engineering Command (NAVFAC) Design Manual 7.02 (Foundations and Earth Structures), the sheet pile penetration was increased by 40% to result in a factor of safety of 2.0. Also, if case IV (deadman anchor) is selected, we recommend that the 'Design Criteria for Deadman Anchorage' presented in NAVFAC Manual 7.02 be used to design the deadman anchors. A summary of the sheet pile wall analyses is presented in **Table D** below:

Table D: Summary of Sheet Pile Wall Analyses

Case	Required Wall Penetration Elevation (ft), NAVD88	Maximum Unfactored Bending Moment (kip-ft)	Required Section Modulus, S (in^3)		Anchor Unfactored Force (kips)	[(1)]Estimated Top Wall Deflection (in.)	Wall Penetration to Wall Unsupported Height
			Grade A-328 Steel	Grade A-572 Steel			
I	-33.0	120.77	61.9	48.3	-	4.9	0.76
II	-34.0	156.87	80.4	62.7	-	4.0	0.80
III	-35.0	183.46	94.1	73.4	-	4.5	0.85
IV	-28.0	28.18	14.5	11.3	5.26	0.5	0.54

Note: [(1)] The estimated top wall deflection is based on the smallest section that meets the required section modulus (see Appendix C)

The steel sheet pile wall and soil modeling, assumptions, CWALSHT input/output files and calculations for all four cases are presented in **Appendix C** of this report.

7.0 CONSTRUCTION RECOMMENDATIONS

7.1 Steel Sheet Pile Installation

Geotechnical design soil parameters for the evaluation of temporary lateral support systems (e.g. sheet piles) are provided in Table B (Section 5.3). The following are our suggestions for the installation of the steel sheet piles:

1. Sheet pile refusal may occur on a random and unpredictable basis due to zones relatively hard rock materials not revealed by the test borings may be found. We recommend that predrilling be considered prior to the installation of the sheet piles. Predrilling is required in order to prevent refusal conditions, damage of the structural section of the sheeting and minimize vibrations-induced settlements to nearby structures. Following predrilling, the piles should be set in place and vibrated or driven to the required tip elevations.

2. The pile installation equipment will produce vibration and noise levels that may be considered disturbing to people and can produce vibrations noticeable in structures. The potential for damage to any adjacent structures during the pile installations will be dependent on the distance from the adjacent structures to the location of the piles installation, the subsurface conditions, and the level of sensitivity of the structure to any type of vibration.

3. We suggest that the recommendations provided in Section 455-1.1 of the FDOT Standard Specifications should be followed for the protection of the existing structures during sheet piling operations. All those structures and or utilities located adjacent to the proposed excavation shall be surveyed as well as monitored for vibrations and settlements in accordance with Section 455-1.1 of the FDOT Standard Specifications.

7.2 Excavation Recommendations without Lateral Support

The existing subsurface materials may be excavated using conventional excavation equipment. It is to be noted that the limestone formation may require special equipment to excavate. Temporary excavations of the existing subsurface materials without the use of lateral support system may be accomplished as follows:

- For granular soils (fill) with maximum side slopes of 1V:2H (min. factor of safety is 1.3)
- For the natural limestone formation with maximum side slopes of 1V:1H (min. factor of safety of 1.3)

As a reference, we recommend that temporary excavations be performed in accordance with OSHA 29 CFR, Standard Number 1926 Subpart P Appendix B, titled “Sloping and Benching”.

7.3 Groundwater Control

Given that the project site is a man-made pier surrounded by the ocean water, groundwater conditions and any dewatering operations will be directly influenced by the ocean tidal conditions. If necessary, dewatering may be accomplished through use of a wellpoint system or submersible pump.

7.4 Testing of Anchors Socketed into Limestone (Concept A)

We recommend that anchor performance tests be conducted to verify the anchor design assumptions and to verify movement or creep. The performance test consists of cyclic incremental loading and unloading of the anchor to the maximum design load. We suggest conducting performance tests in the first two anchors followed by performance tests on two percent of the remaining anchors. The performance tests must be followed by proof tests on every production anchor (not previously performance tested). The proof test is a single cycle test in which the design load is applied in increments until the maximum load is reached. We recommend that the anchor's manufacturer provides the required testing specifications for its product.

8.0 CLOSURE

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This company is not responsible for the conclusions, opinions or recommendations made by others based on these data. No other warranties are implied or expressed.

The analyses and recommendations submitted in this report are based upon the data obtained from the soil borings and rock coring performed at the locations indicated. If any subsoil variations become evident during the course of this project, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event significant changes occur in the design, nature or location of the proposed bulkhead wall.

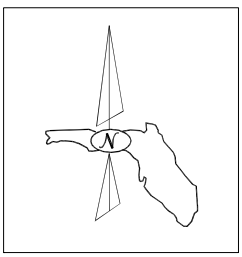
This report has been prepared for the exclusive use of Appledore Marine Engineering, Inc. for the specific application to the design and construction of the damaged bulkhead wall at Breakwater 497 at the Key West Naval Station in Monroe County, Florida.

oOo

APPENDIX A

Figure 1: U.S.G.S. Quadrangle Map
Figure 2: Boring Location Plan
Figure 3: Soil/Rock Profiles

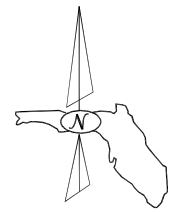
REFERENCE: U.S.G.S. "KEY WEST, FLORIDA" QUADRANGLE MAP ISSUED: 1971 REVISED: NONE
SECTION: N/A
TOWNSHIP: 67 SOUTH
RANGE: 25 EAST
SCALE: 1" = 2000'



U.S.G.S. QUADRANGLE MAP
KEY WEST AIR STATION (BREAKWATER 497)
TRUMAN ANNEX
KEY WEST, FLORIDA

DRAWN: MG	NODARSE & ASSOCIATES, INC.	
CHKD: JB		
SCALE: 1"=2000'		
DATE: 8-13-10	PROJ. NO: 08-09-0021-102A	FIGURE: 1

Aug 13, 2010 - 2:32pm R:\2009\08-09-0021\102\A\cad\08-09-0021-101a-Figure-1.dwg



HORIZONTAL SCALE IN FEET

0 100 200

LEGEND

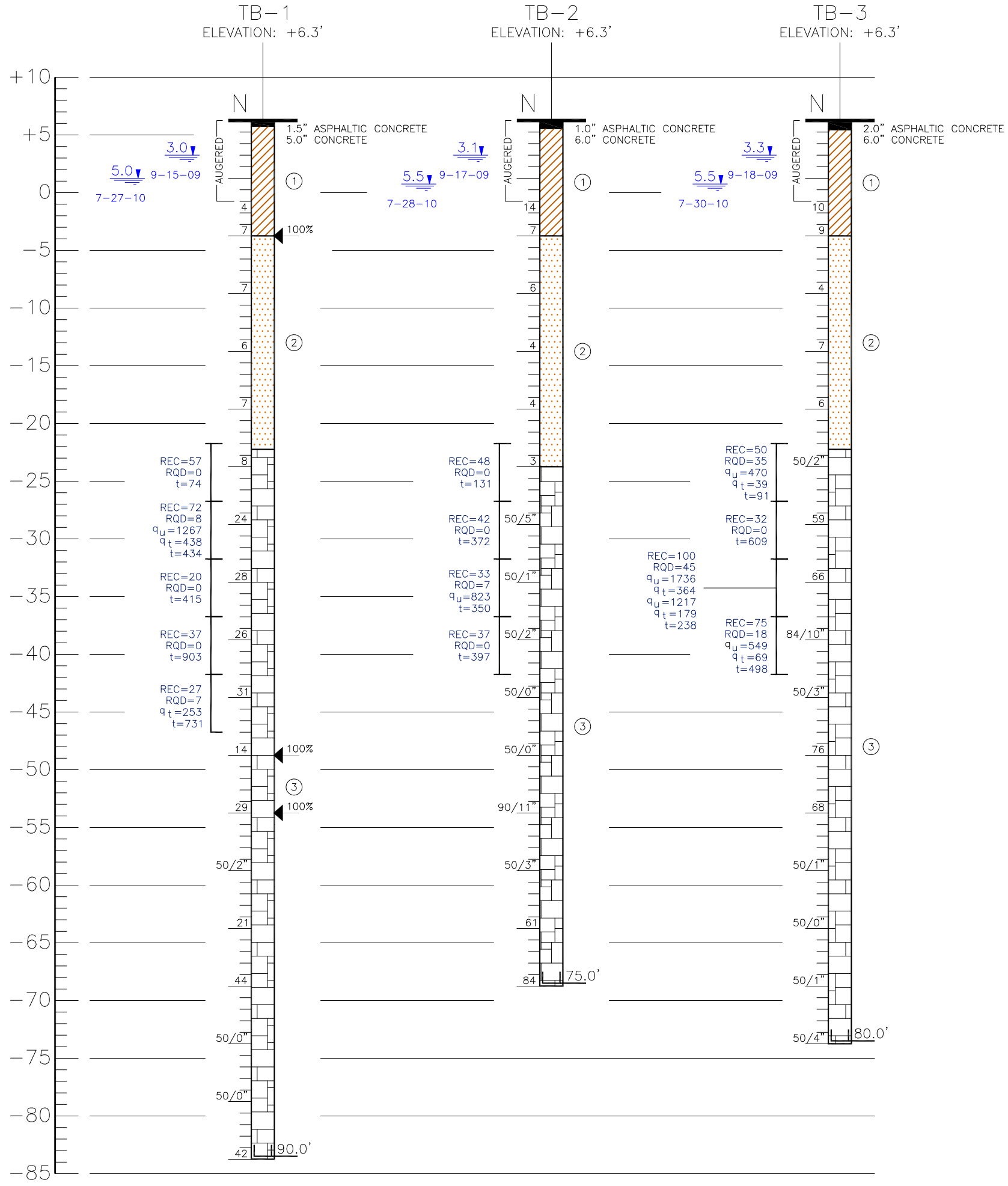
APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

APPROXIMATE LOCATION OF 4 INCH DIAMETER ROCK CORING

BORING AND ROCK CORING LOCATION PLAN
KEY WEST NAVAL AIR STATION
(BREAKWATER 497) TRUMAN ANNEX
KEY WEST, FLORIDA

DRAWN: MG	NODARSE & ASSOCIATES, INC.
CHKD: JB	
SCALE: 1"=2000'	
DATE: 8-13-10	PROJ. NO: 08-09-0021-102A
	FIGURE: 2

Aug19, 2010-1:35pm R:\2009\08-09-0021\102A\cad\08-09-0021-102a-Figure-2.dwg



LEGEND

①	LIGHT BROWN TO BROWN LIMEROCK WITH SLIGHTLY SILTY MEDIUM TO COARSE SAND, SOME SHELL (FILL) (GP)(GP–GM)
②	GRAY TO LIGHT BROWN MEDIUM TO COARSE SAND WITH FEW TO SOME SHELL AND LIMESTONE FRAGMENTS (SP)
③	LIGHT BROWN LIMESTONE WITH SLIGHTLY SILTY FINE SAND
(SP)	UNIFIED SOIL CLASSIFICATION GROUP SYMBOL AS DETERMINED BY VISUAL EXAMINATION
3.3 ▼ 9-18-09	DEPTH TO GROUNDWATER LEVEL IN FEET WITH DATE OF READING
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
50/3"	(50) BLOWS REQUIRED TO DRIVE SAMPLING SPOON (3) INCHES
80.0'	DEPTH TO WHICH NW CASING WAS DRIVEN IN FEET (NOTE: 3–INCH CASING)
100%	CIRCULATION LOSS (%)

ROCK CORE INFORMATION

REC	RECOVERY (%)
RQD	ROCK QUALITY DESIGNATION (%)
q_u	UNCONFINED COMPRESSION STRENGTH (PSI)
q_t	SPLIT TENSILE STRENGTH (PSI)
t	CORING TIME (SECONDS)

NOTE:

BORING ELEVATIONS WERE SCALED FROM DRAWINGS PROVIDED TO NODARSE AND ASSOCIATES, INC AND SHOULD BE CONSIDERED APPROXIMATE. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM 1988 (NAVD).

SOIL/ROCK BORING PROFILES
KEY WEST NAVAL AIR STATION
(BREAKWATER 497) TRUMAN ANNEX
KEY WEST, FLORIDA

DRAWN: MG	NODARSE & ASSOCIATES, INC.		
CHKD: JB			
SCALE: 1"=2000'			
DATE: 9–30–09	PROJ. NO: 08–09–0021–102A	FIGURE: 3	

Aug19, 2010–1:36pm R:\2009\08–09–0021\102\AA\cad\08–09–0021–102a–Figure–3.dwg

APPENDIX B

Table 1: Summary of Laboratory Tests Results (Rock Coring Program)
Table 2: Summary of Rock Side Shear Determination per FDOT SFH 2009
Table 3: Summary of Rock Unit Weight Determination
Figures 4 to 6: Photographs of Rock Cores

NODARSE & ASSOCIATES, INC.

NAVAL AIR STATION BREAKWATER 497
KEY WEST, FLORIDA
PROJECT NO. 08-09-0021-102
TABLE 1 : SUMMARY OF LABORATORY TEST RESULTS (ROCK CORING PROGRAM)

Sample ID				Geometry			WEIGHT						Uniaxial Compression Test				Split Tensile Test	
Sample ID	Boring No.	Core Run Depth (ft)		Sample Height (inches)	Sample Diameter (inches)	Volume (cubic-feet)	Sample Weight (lbs)		Water Content %	Saturated Sample Weight (lbs)	γ wet (pcf)	γ dry (pcf)	Failure Load (lbs)	L/D Ratio	Correction Factor	qu (psi)	Failure Load (lbs)	qt (psi)
		From	To				Wet	Dry										
C-1	TB-1	33.0	38.0	3.59	3.78	0.023	0.3	0.2	11.5	2.9	123	110	16060.0	1.0	1.13	1267		
C-2	TB-2	38.0	43.0	3.90	3.78	0.025	0.3	0.3	12.4	3.2	128	114	10280.0	1.0	1.11	823		
C-3	TB-3	28.0	33.0	5.14	3.92	0.036	0.3	0.2	15.9	4.0	112	97	6010.0	1.3	1.06	470		
C-4	TB-3	38.0	43.0	7.47	3.87	0.051	0.3	0.3	14.7	6.5	127	111	20530.0	1.9	1.00	1736		
C-5	TB-3	38.0	43.0	4.14	3.82	0.027	0.3	0.3	16.0	3.5	128	110	15360.0	1.1	1.10	1217		
C-6	TB-3	43.0	48.0	5.73	3.73	0.036	0.4	0.3	22.0	3.5	96	79	6220.0	1.5	1.04	549		
S-1	TB-1	33.0	38.0	2.6	3.8	0.018	1.0	0.9	8.3	2.3	133	123					6920.0	438
S-2	TB-1	48.0	53.0	2.0	3.8	0.014	0.8	0.7	6.4	1.5	114	107					3080.0	253
S-3	TB-3	28.0	33.0	4.5	3.9	0.031	1.6	1.3	26.7	3.4	109	86					1080.0	39
S-4	TB-3	38.0	43.0	2.9	3.9	0.019	1.0	0.8	14.8	2.5	127	110					6330.0	364
S-5	TB-3	38.0	43.0	2.8	3.8	0.019	1.1	1.0	15.0	2.1	112	97					3030.0	179
S-6	TB-3	43.0	48.0	3.0	3.8	0.020	1.1	1.0	14.2	2.0	100	87					1270.0	69

NODARSE & ASSOCIATES, INC.

NAVAL AIR STATION BREAKWATER 497
KEY WEST, FLORIDA
PROJECT NO. 08-09-0021-102
TABLE 2 : SUMMARY OF ROCK SIDE SHEAR DETERMINATION PER FDOT SFH 2009

	Core Sample Interval		Unmodified		Modified	
Boring No.	**Top**	**Bottom**	**q_u (tsf)**	**q_t (tsf)**	**q_u (tsf)**	**q_t (tsf)**
TB-1	33	38	91.2	31.5	91.2	-
TB-1	48	53	-	18.2	-	18.2
TB-2	38	43	59.2	-	59.2	-
TB-3	28	33	33.8	2.8	-	-
TB-3	38	43	125.0	26.2	-	26.2
TB-3	38	43	87.6	12.9	87.6	12.9
TB-3	43	48	39.6	5.0	39.6	5.0

	Unmodified		Modified		$f_{su\ (unmodified),\ tsf}$	$f_{su\ (modified),\ tsf}$	$f_{su\ (modified),\ tsf}$
SUM	436.5	96.6	277.6	62.3	-	-	Mean and lower bound Average
MEAN (μ)	72.7	16.1	69.4	15.6	17.1	16.4	
STANDARD DEVIATION (σ)	34.9	11.4	24.5	8.9	-	-	**12.6** ←
UPPER BOUND (μ+σ)	107.7	27.5	93.9	24.5	27.2	24.0	
LOWER BOUND ((μ-σ)	37.8	4.7	44.9	6.7	6.6	8.6	

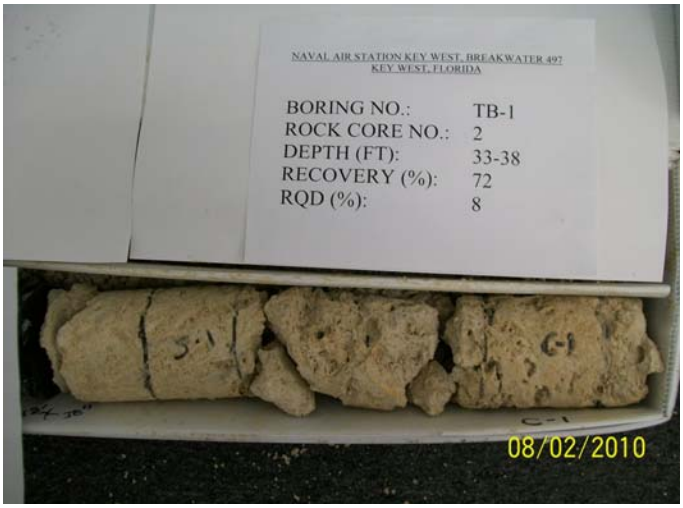
NODARSE & ASSOCIATES, INC.

NAVAL AIR STATION BREAKWATER 497
KEY WEST, FLORIDA
PROJECT NO. 08-09-0021-102
TABLE 3 : SUMMARY OF ROCK UNIT WEIGTH DETERMINATION

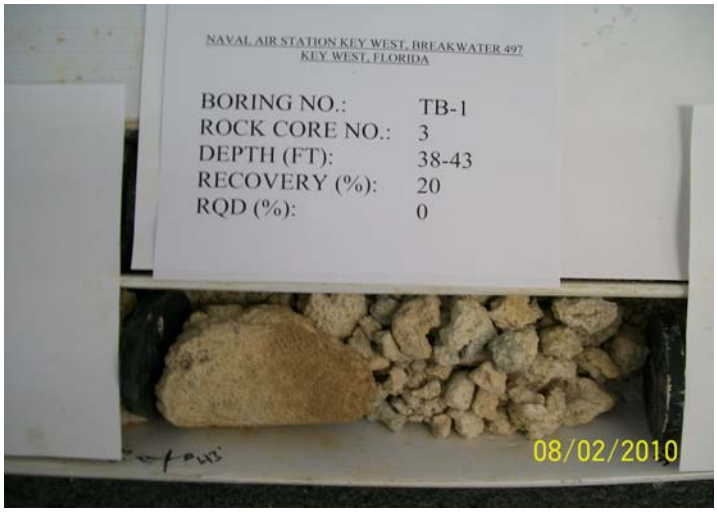
	Core Sample Interval		Unmodified	Modified
Boring No.	**Top**	**Bottom**	**Unit Weight (pcf)**	**Unit Weight (pcf)**
TB-1	33	38	122.8	122.8
TB-2	38	43	127.9	127.9
TB-3	28	33	112.2	112.2
TB-3	38	43	126.9	126.9
TB-3	38	43	127.9	127.9
TB-3	43	48	96.4	-
TB-1	33	38	133.2	-
TB-1	48	53	114.3	114.3
TB-3	28	33	109.2	109.2
TB-3	38	43	126.7	126.7
TB-3	38	43	112.0	112.0
TB-3	43	48	99.6	-

	Unmodified	Modified
SUM	1409.0	1079.8
MEAN (μ)	117.4	**120.0** ←
STANDARD DEVIATION (σ)	11.9	7.9
UPPER BOUND (μ+σ)	129.3	127.9
LOWER BOUND ((μ-σ)	105.5	112.1

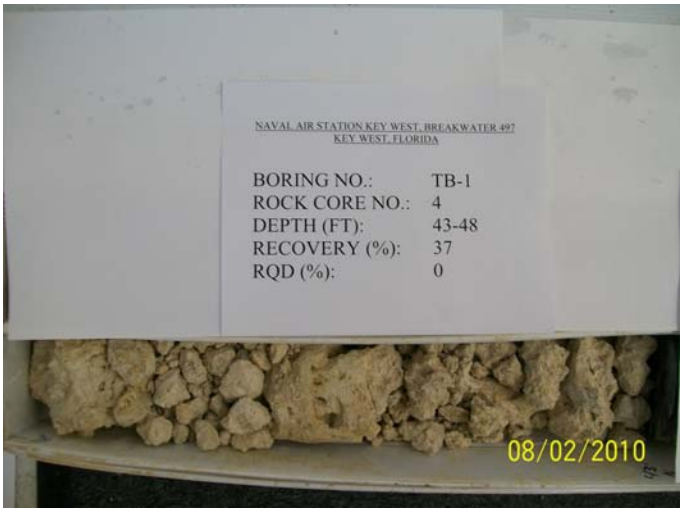
TB-1, Core Run 1, Depth Interval 28-33 feet



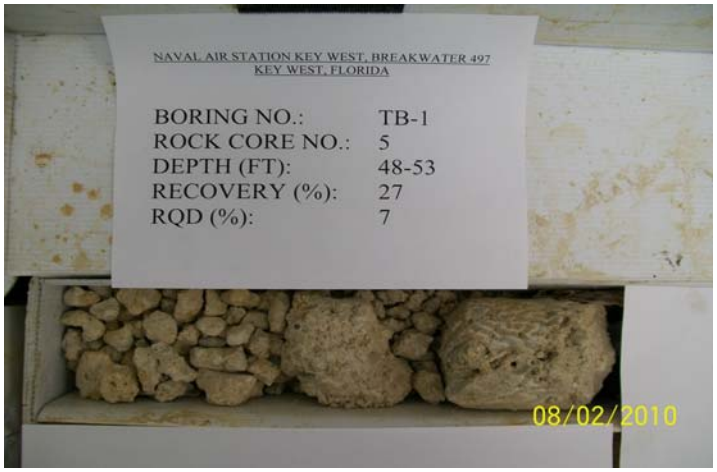
TB-1, Core Run 2, Depth Interval 33-38 feet



TB-1, Core Run 3, Depth Interval 38-43 feet

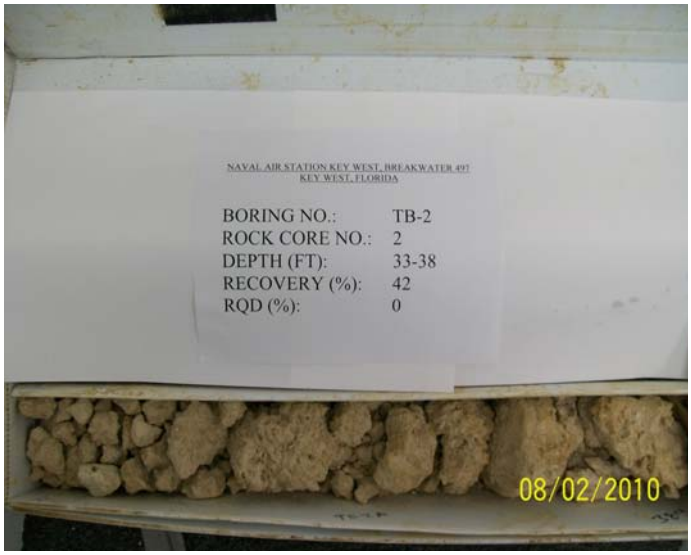


TB-1, Core Run 4, Depth Interval 43-48 feet



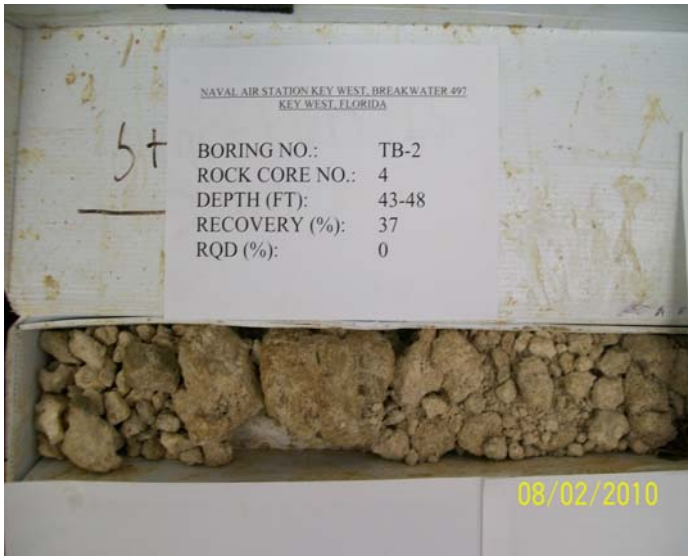
TB-1, Core Run 5, Depth Interval 48-53 feet

TB-2, Core Run 1, Depth Interval 28-33 feet



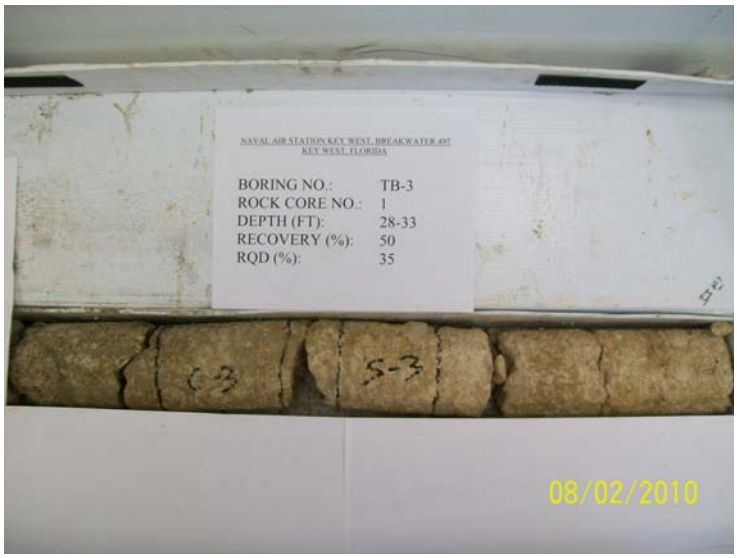
TB-2, Core Run 2, Depth Interval 33-38 feet

TB-2, Core Run 3, Depth Interval 38-43 feet

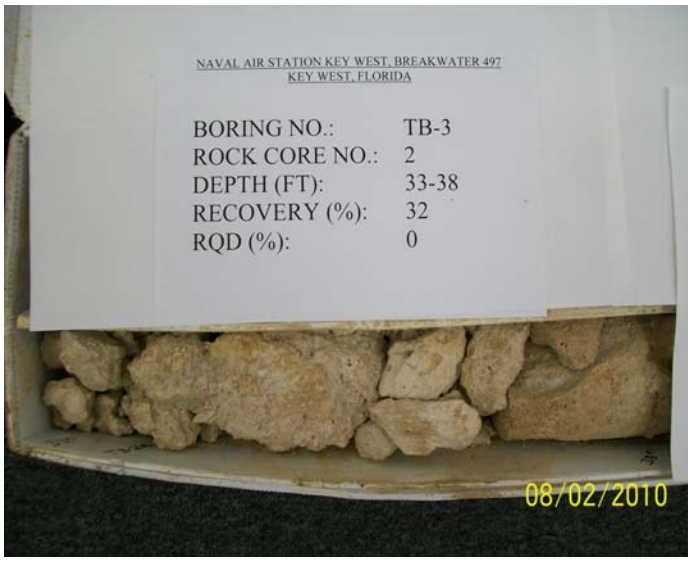


TB-2, Core Run 4, Depth Interval 43-48 feet

Naval Air Station Breakwater 497 **Key West, Florida**	NODARSE & ASSOCIATES, INC.	**Figure 5: Photographs of Rock Cores** **N&A Project No. 08-09-0021-102**



TB-3, Core Run 1, Depth Interval 28-33 feet



TB-3, Core Run 2, Depth Interval 33-38 feet

TB-3, Core Run 3, Depth Interval 38-43 feet

TB-3, Core Run 4, Depth Interval 43-48 feet

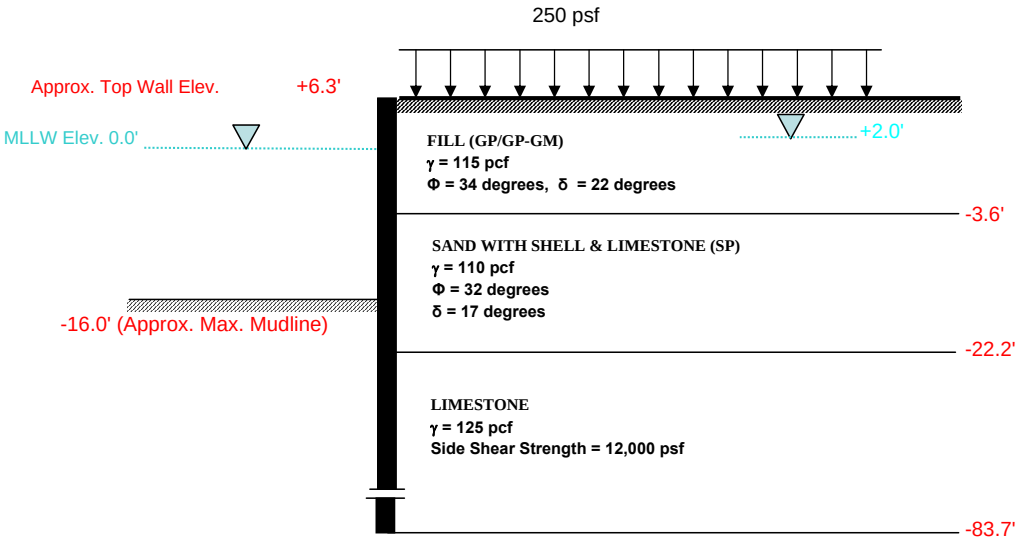
Naval Air Station Breakwater 497 **Key West, Florida**	NODARSE & ASSOCIATES, INC.	**Figure 6: Photographs of Rock Cores** **N&A Project No. 08-09-0021-102**

APPENDIX C

Case I – Cantilever Steel Sheet Wall Analysis and CWALSTH Input and Output Files – Surcharge 250 psf
Case II – Cantilever Steel Sheet Wall Analysis and CWALSTH Input and Output Files – Surcharge 600 psf
Case III – Cantilever Steel Sheet Wall Analysis and CWALSTH Input and Output Files – Point Load 8 kips
Case IV – Anchored Deadman/Socket into Limestone Steel Sheet Wall Analysis and CWALSTH Input and Output Files – Surcharge 600 psf

Key West Naval Air Station (Breakwater 497)
Truman Annex, Key West, Florida
N&A Project No. 08-09-0021-101

CASE I: **Steel Sheet Pile Bulkhead, Cantilever (Sta. 12+90 to 16+46)**



Input from CWALSHT Output

(Calculated) Wall Penetration (ft) =	11.73 →	Elevation (ft) =	**-28.00**
(Required) Wall Penetration (ft)=	**17.0** →	Elevation (ft) =	**-33.00**

Maximum Bending Moment, Mmax (Kips-ft) = 120.77

Nominal Yield Strength for Grade A-328 Steel (ksi)	39
Allowable Working Stress for Grade A-328 Steel, Fb (ksi) = 60% * 39 =	23.4
Nominal Yield Strength for Grade A-572 Steel (ksi)	50
Allowable Working Stress for Grade A-572 Steel, Fb (ksi) = 60% * 50 =	30
Required Section Modulus, S (in^3) for A-328 = Mmax / Fb =	**61.9**
Required Section Modulus, S (in^3) for A-572 = Mmax / Fb =	**48.3**

Scaled Deflection ($lbs\text{-}in^3$) 5.77180E+10

*Section	Section Modulus (in^3/ft)	Moment of Inertia (in^4/ft)	Deflection (in)
AZ-25	45.7	382.6	-
AZ-26	48.4	406.5	4.90
AZ-28	51.2	431.6	4.61
AZ-37	68.9	676.6	2.94
AZ-39	72.5	714	2.79
AZ-41	76.2	751.4	2.65
AZ-46	85.5	808.8	2.46
AZ-48	89.3	847.1	2.35
AZ-50	93.3	886.5	2.25

*The sheet pile section was selected to estimate the top wall deflection. The actual sheet pile section should be selected by The Designer.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 14:48:50

****
* INPUT DATA *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 6.30 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
100.00	6.30

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
100.00	-16.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
115.00	110.00	34.00	0.00	22.00	0.00	-3.60	0.00	DEF	DEF
110.00	105.00	32.00	0.00	17.00	0.00	-22.20	0.00	DEF	DEF
125.00	120.00	0.00	12000.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
110.00	105.00	32.00	0.00	17.00	0.00	-22.20	0.00	DEF	DEF
125.00	120.00	0.00	12000.00	0.00	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 2.00 (FT)
LEFTSIDE ELEVATION = 0.00 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

VII.A.--VERTICAL LINE LOADS
NONE

VII.B.--VERTICAL UNIFORM LOADS

LEFTSIDE (PSF)	RIGHTSIDE (PSF)
0.00	250.00

VII.C.--VERTICAL STRIP LOADS
NONE

VII.D.--VERTICAL RAMP LOADS
NONE

VII.E.--VERTICAL TRIANGULAR LOADS
NONE

VII.F.--VERTICAL VARIABLE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 14:48:52

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<------NET------> (SOIL + WATER) ACTIVE (PSF)	PASSIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
6.3	0.0	0.0	0.0	59.0	1741.3	59.0	1741.3
5.3	0.0	0.0	0.0	84.9	2507.5	84.9	2507.5
4.3	0.0	0.0	0.0	110.8	3273.6	110.8	3273.6
3.3	0.0	0.0	0.0	136.8	4039.8	136.8	4039.8

Cantilever 250 psf

2.3	0.0	0.0	0.0	162.7	4806.0	162.7	4806.0
2.0	0.0	0.0	0.0	170.5	5035.8	170.5	5035.8
1.3	43.7	0.0	0.0	222.9	5336.0	179.2	5292.3
0.3	106.1	0.0	0.0	297.7	5764.7	191.6	5658.7
0.0	124.8	0.0	0.0	320.1	5893.4	195.3	5768.6
-0.7	124.8	0.0	0.0	328.8	6149.8	204.0	6025.0
-1.7	124.8	0.0	0.0	341.2	6516.2	216.4	6391.4
-2.7	124.8	0.0	0.0	353.6	6882.6	228.8	6757.8
-3.6+	124.8	0.0	0.0	364.8	7212.3	240.0	7087.5
-3.6-	124.8	0.0	0.0	394.7	5684.6	269.9	5559.8
-3.7	124.8	0.0	0.0	395.9	5710.6	271.1	5585.8
-4.7	124.8	0.0	0.0	408.6	5970.7	283.8	5845.9
-5.7	124.8	0.0	0.0	421.2	6230.8	296.4	6106.0
-6.7	124.8	0.0	0.0	433.8	6490.9	309.0	6366.1
-7.7	124.8	0.0	0.0	446.4	6751.0	321.6	6626.2
-8.7	124.8	0.0	0.0	459.1	7011.0	334.3	6886.2
-9.7	124.8	0.0	0.0	471.7	7271.1	346.9	7146.3
-10.7	124.8	0.0	0.0	484.3	7531.2	359.5	7406.4
-11.7	124.8	0.0	0.0	496.9	7791.3	372.1	7666.5
-12.7	124.8	0.0	0.0	509.6	8051.4	384.8	7926.6
-13.7	124.8	0.0	0.0	522.2	8311.4	397.4	8186.6
-14.7	124.8	0.0	0.0	534.8	8571.5	410.0	8446.7
-15.7	124.8	0.0	0.0	547.4	8831.6	422.6	8706.8
-16.0	124.8	0.0	0.0	551.2	8909.6	426.4	8784.8
-16.7	124.8	182.1	8.8	378.0	9082.8	435.3	8966.9
-17.0	124.8	260.1	12.6	303.8	9157.1	439.1	9044.9
-17.7	124.8	442.1	21.5	130.6	9330.3	447.9	9227.0
-18.2	124.8	579.4	28.1	0.0	9460.9	454.6	9364.2
-18.7	124.8	702.2	34.1	-116.9	9577.8	460.5	9487.0
-19.7	124.8	962.3	46.7	-364.4	9825.2	473.1	9747.1
-20.7	124.8	1222.4	59.3	-611.8	10072.7	485.8	10007.2
-21.7	124.8	1482.5	72.0	-859.3	10320.1	498.4	10267.3
-22.2+	124.8	1612.5	78.3	-12576.7	18235.8	504.7	10397.3
-22.2-	124.8	24295.1	0.0	-12576.7	18235.8	0.0	25902.9
-22.7	124.8	24326.4	0.0	-24201.6	26059.0	0.0	25934.2
-23.7	124.8	24389.0	0.0	-24264.2	26121.6	0.0	25996.8
-24.7	124.8	24451.6	0.0	-24326.8	26184.2	0.0	26059.4
-25.7	124.8	24514.2	0.0	-24389.4	26246.8	0.0	26122.0
-26.7	124.8	24576.8	0.0	-24452.0	26309.4	0.0	26184.6
-27.7	124.8	24639.4	0.0	-24514.6	26372.0	0.0	26247.2
-28.7	124.8	24702.0	0.0	-24577.2	26434.6	0.0	26309.8
-29.7	124.8	24764.6	0.0	-24639.8	26497.2	0.0	26372.4
-30.7	124.8	24827.2	0.0	-24702.4	26559.8	0.0	26435.0
-31.7	124.8	24889.8	0.0	-24765.0	26622.4	0.0	26497.6
-32.7	124.8	24952.4	0.0	-24827.6	26685.0	0.0	26560.2
-33.7	124.8	25015.0	0.0	-24890.2	26747.6	0.0	26622.8
-34.7	124.8	25077.6	0.0	-24952.8	26810.2	0.0	26685.4
-35.7	124.8	25140.2	0.0	-25015.4	26872.8	0.0	26748.0
-36.7	124.8	25202.8	0.0	-25078.0	26935.4	0.0	26810.6
-37.7	124.8	25265.4	0.0	-25140.6	26998.0	0.0	26873.2
-38.7	124.8	25328.0	0.0	-25203.2	27060.6	0.0	26935.8
-39.7	124.8	25390.6	0.0	-25265.8	27123.2	0.0	26998.4
-40.7	124.8	25453.2	0.0	-25328.4	27185.8	0.0	27061.0
-41.7	124.8	25515.8	0.0	-25391.0	27248.4	0.0	27123.6
-42.7	124.8	25578.4	0.0	-25453.6	27311.0	0.0	27186.2
-43.7	124.8	25641.0	0.0	-25516.2	27373.6	0.0	27248.8
-44.7	124.8	25703.6	0.0	-25578.8	27436.2	0.0	27311.4
-45.7	124.8	25766.2	0.0	-25641.4	27498.8	0.0	27374.0
-46.7	124.8	25828.8	0.0	-25704.0	27561.4	0.0	27436.6
-47.7	124.8	25891.4	0.0	-25766.6	27624.0	0.0	27499.2
-48.7	124.8	25954.0	0.0	-25829.2	27686.6	0.0	27561.8
-49.7	124.8	26016.6	0.0	-25891.8	27749.2	0.0	27624.4
-50.7	124.8	26079.2	0.0	-25954.4	27811.8	0.0	27687.0

Cantilever 250 psf

-51.7	124.8	26141.8	0.0	-26017.0	27874.4	0.0	27749.6
-52.7	124.8	26204.4	0.0	-26079.6	27937.0	0.0	27812.2
-53.7	124.8	26267.0	0.0	-26142.2	27999.6	0.0	27874.8
-54.7	124.8	26329.6	0.0	-26204.8	28062.2	0.0	27937.4
-55.7	124.8	26392.2	0.0	-26267.4	28124.8	0.0	28000.0
-56.7	124.8	26454.8	0.0	-26330.0	28187.4	0.0	28062.6
-57.7	124.8	26517.4	0.0	-26392.6	28250.0	0.0	28125.2
-58.7	124.8	26580.0	0.0	-26455.2	28312.6	0.0	28187.8
-59.7	124.8	26642.6	0.0	-26517.8	28375.2	0.0	28250.4
-60.7	124.8	26705.2	0.0	-26580.4	28437.8	0.0	28313.0
-61.7	124.8	26767.8	0.0	-26643.0	28500.4	0.0	28375.6
-62.7	124.8	26830.4	0.0	-26705.6	28563.0	0.0	28438.2
-63.7	124.8	26893.0	0.0	-26768.2	28625.6	0.0	28500.8
-64.7	124.8	26955.6	0.0	-26830.8	28688.2	0.0	28563.4
-65.7	124.8	27018.2	0.0	-26893.4	28750.8	0.0	28626.0
-66.7	124.8	27080.8	0.0	-26956.0	28813.4	0.0	28688.6
-67.7	124.8	27143.4	0.0	-27018.6	28876.0	0.0	28751.2
-68.7	124.8	27206.0	0.0	-27081.2	28938.6	0.0	28813.8
-69.7	124.8	27268.6	0.0	-27143.8	29001.2	0.0	28876.4
-70.7	124.8	27331.2	0.0	-27206.4	29063.8	0.0	28939.0
-71.7	124.8	27393.8	0.0	-27269.0	29126.4	0.0	29001.6
-72.7	124.8	27456.4	0.0	-27331.6	29189.0	0.0	29064.2
-73.7	124.8	27519.0	0.0	-27394.2	29251.6	0.0	29126.8
-74.7	124.8	27581.6	0.0	-27456.8	29314.2	0.0	29189.4
-75.7	124.8	27644.2	0.0	-27519.4	29376.8	0.0	29252.0
-76.7	124.8	27706.8	0.0	-27582.0	29439.4	0.0	29314.6
-77.7	124.8	27769.4	0.0	-27644.6	29502.0	0.0	29377.2
-78.7	124.8	27832.0	0.0	-27707.2	29564.6	0.0	29439.8
-79.7	124.8	27894.6	0.0	-27769.8	29627.2	0.0	29502.4
-80.7	124.8	27957.2	0.0	-27832.4	29689.8	0.0	29565.0
-81.7	124.8	28019.8	0.0	-27895.0	29752.4	0.0	29627.6
-82.7	124.8	28082.4	0.0	-27957.6	29815.0	0.0	29690.2
-83.7	124.8	28145.0	0.0	-28020.2	29877.6	0.0	29752.8

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 14:48:53

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

WALL BOTTOM ELEV. (FT) : -27.73
PENETRATION (FT) : 11.73

MAX. BEND. MOMENT (LB-FT) : 1.2077E+05
AT ELEVATION (FT) : -22.45

MAX. SCALED DEFL. (LB-IN^3): 5.7718E+10
AT ELEVATION (FT) : 6.30

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 18-AUGUST-2010 TIME: 14:48:53

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--RESULTS0. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
6.30	0.0000E+00	0.	5.7718E+10	58.96
5.30	3.3804E+01	72.	5.5341E+10	84.90
4.30	1.5251E+02	170.	5.2964E+10	110.85
3.30	3.8207E+02	294.	5.0588E+10	136.79
2.30	7.4842E+02	443.	4.8212E+10	162.73
2.00	8.8887E+02	493.	4.7499E+10	170.52
1.30	1.2803E+03	631.	4.5837E+10	222.88
0.30	2.0353E+03	891.	4.3465E+10	297.69
0.00	2.3164E+03	984.	4.2754E+10	320.13
-0.70	3.0844E+03	1211.	4.1096E+10	328.81
-1.70	4.4620E+03	1546.	3.8733E+10	341.22
-2.70	6.1808E+03	1894.	3.6377E+10	353.62
-3.60	8.0298E+03	2217.	3.4266E+10	364.79
-3.60	8.0298E+03	2217.	3.4266E+10	394.68
-3.70	8.2534E+03	2256.	3.4032E+10	395.95
-4.70	1.0710E+04	2659.	3.1702E+10	408.57
-5.70	1.3575E+04	3074.	2.9390E+10	421.20
-6.70	1.6861E+04	3501.	2.7101E+10	433.82
-7.70	2.0581E+04	3941.	2.4842E+10	446.45
-8.70	2.4748E+04	4394.	2.2618E+10	459.07
-9.70	2.9373E+04	4859.	2.0437E+10	471.70
-10.70	3.4471E+04	5337.	1.8307E+10	484.32
-11.70	4.0052E+04	5828.	1.6237E+10	496.94
-12.70	4.6131E+04	6331.	1.4236E+10	509.57
-13.70	5.2719E+04	6847.	1.2314E+10	522.19
-14.70	5.9829E+04	7376.	1.0484E+10	534.82

-15.70	6.7474E+04	7917.	8.7573E+09	547.44
-16.00	6.9874E+04	8082.	8.2614E+09	551.23
-16.70	7.5652E+04	8407.	7.1473E+09	378.01
-17.00	7.8190E+04	8509.	6.6891E+09	303.78
-17.70	8.4206E+04	8661.	5.6680E+09	130.56
-18.23	8.8788E+04	8695.	4.9453E+09	0.00
-18.70	9.2892E+04	8668.	4.3343E+09	-116.90
-19.70	1.0146E+05	8427.	3.1611E+09	-364.36
-20.70	1.0966E+05	7939.	2.1631E+09	-611.81
-21.70	1.1726E+05	7204.	1.3546E+09	-859.27
-22.20	1.2026E+05	3845.	1.0255E+09	-12576.66
-22.70	1.2013E+05	-5350.	7.4822E+08	-24201.62
-22.70	1.2010E+05	-5456.	7.4602E+08	-24201.90
-23.70	1.0433E+05	-24563.	3.4642E+08	-14180.13
-24.70	7.4357E+04	-33710.	1.2285E+08	-4114.12
-25.70	4.0268E+04	-32791.	2.7187E+07	5951.90
-26.70	1.2130E+04	-21806.	1.9598E+06	16017.92
-27.70	1.0394E+01	-755.	9.4317E-01	26083.93
-27.73	0.0000E+00	0.	0.0000E+00	26373.82

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

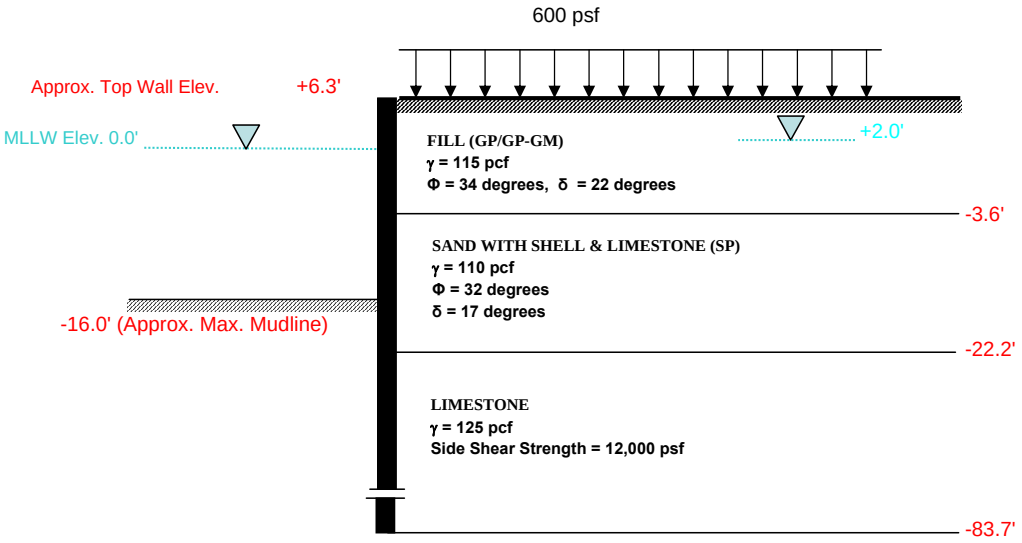
		<----------SOIL PRESSURES---------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
6.30	0.	0.	0.	59.	1741.
5.30	0.	0.	0.	85.	2507.
4.30	0.	0.	0.	111.	3274.
3.30	0.	0.	0.	137.	4040.
2.30	0.	0.	0.	163.	4806.
2.00	0.	0.	0.	171.	5036.
1.30	44.	0.	0.	179.	5292.
0.30	106.	0.	0.	192.	5659.
0.00	125.	0.	0.	195.	5769.
-0.70	125.	0.	0.	204.	6025.
-1.70	125.	0.	0.	216.	6391.
-2.70	125.	0.	0.	229.	6758.
-3.60+	125.	0.	0.	240.	7088.
-3.60+	125.	0.	0.	270.	5560.
-3.70	125.	0.	0.	271.	5586.
-4.70	125.	0.	0.	284.	5846.
-5.70	125.	0.	0.	296.	6106.
-6.70	125.	0.	0.	309.	6366.
-7.70	125.	0.	0.	322.	6626.
-8.70	125.	0.	0.	334.	6886.
-9.70	125.	0.	0.	347.	7146.
-10.70	125.	0.	0.	360.	7406.
-11.70	125.	0.	0.	372.	7666.
-12.70	125.	0.	0.	385.	7927.
-13.70	125.	0.	0.	397.	8187.
-14.70	125.	0.	0.	410.	8447.
-15.70	125.	0.	0.	423.	8707.
-16.00	125.	0.	0.	426.	8785.
-16.70	125.	182.	9.	435.	8967.
-17.00	125.	260.	13.	439.	9045.
-17.70	125.	442.	21.	448.	9227.
-18.23	125.	579.	28.	455.	9364.

Cantilever 250 psf

-18.70	125.	702.	34.	461.	9487.
-19.70	125.	962.	47.	473.	9747.
-20.70	125.	1222.	59.	486.	10007.
-21.70	125.	1482.	72.	498.	10267.
-22.20+	125.	1612.	78.	505.	10397.
-22.20+	125.	24295.	0.	0.	25903.
-22.70	125.	24326.	0.	0.	25934.
-22.70	125.	24327.	0.	0.	25934.
-23.70	125.	24389.	0.	0.	25997.
-24.70	125.	24452.	0.	0.	26059.
-25.70	125.	24514.	0.	0.	26122.
-26.70	125.	24577.	0.	0.	26185.
-27.70	125.	24639.	0.	0.	26247.
-27.73	125.	24702.	0.	0.	26310.
-29.70	125.	24765.	0.	0.	26372.

Key West Naval Air Station (Breakwater 497)
Truman Annex, Key West, Florida
N&A Project No. 08-09-0021-101

CASE II: **Steel Sheet Pile Bulkhead, Cantilever (Sta. 12+90 to 16+46)**



Input from CWALSHT Output

(Calculated) Wall Penetration (ft) =	12.53	→ Elevation (ft) =	**-29.00**
(Required) Wall Penetration (ft)=	**18.0**	→ Elevation (ft) =	**-34.00**

Maximum Bending Moment, Mmax (Kips-ft) = 156.87

Nominal Yield Strength for Grade A-328 Steel (ksi)	39
Allowable Working Stress for Grade A-328 Steel, Fb (ksi) = 60% * 39 =	23.4
Nominal Yield Strength for Grade A-572 Steel (ksi)	50
Allowable Working Stress for Grade A-572 Steel, Fb (ksi) = 60% * 50 =	30
Required Section Modulus, S (in^3) for A-328 = Mmax / Fb =	**80.4**
Required Section Modulus, S (in^3) for A-572 = Mmax / Fb =	**62.7**

Scaled Deflection ($lbs\text{-}in^3$) 7.93600E+10

Section	*Section Modulus (in^3/ft)*	*Moment of Inertia (in^4/ft)*	*Deflection (in)*
AZ-25	45.7	382.6	-
AZ-26	48.4	406.5	-
AZ-28	51.2	431.6	-
AZ-37	68.9	676.6	4.04
AZ-39	72.5	714	3.83
AZ-41	76.2	751.4	3.64
AZ-46	85.5	808.8	3.38
AZ-48	89.3	847.1	3.23
AZ-50	93.3	886.5	3.09

*The sheet pile section was selected to estimate the top wall deflection. The actual sheet pile section should be selected by The Designer.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 14:56:01

****
* INPUT DATA *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 6.30 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
100.00	6.30

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
100.00	-16.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
115.00	110.00	34.00	0.00	22.00	0.00	-3.60	0.00	DEF	DEF
110.00	105.00	32.00	0.00	17.00	0.00	-22.20	0.00	DEF	DEF
125.00	120.00	0.00	12000.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
110.00	105.00	32.00	0.00	17.00	0.00	-22.20	0.00	DEF	DEF
125.00	120.00	0.00	12000.00	0.00	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 2.00 (FT)
LEFTSIDE ELEVATION = 0.00 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

VII.A.--VERTICAL LINE LOADS
NONE

VII.B.--VERTICAL UNIFORM LOADS

LEFTSIDE (PSF)	RIGHTSIDE (PSF)
0.00	600.00

VII.C.--VERTICAL STRIP LOADS
NONE

VII.D.--VERTICAL RAMP LOADS
NONE

VII.E.--VERTICAL TRIANGULAR LOADS
NONE

VII.F.--VERTICAL VARIABLE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 14:56:03

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<------NET------> (SOIL + WATER) ACTIVE (PSF)	PASSIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
6.3	0.0	0.0	0.0	141.5	4179.1	141.5	4179.1
5.3	0.0	0.0	0.0	167.5	4945.3	167.5	4945.3
4.3	0.0	0.0	0.0	193.4	5711.5	193.4	5711.5
3.3	0.0	0.0	0.0	219.3	6477.6	219.3	6477.6

Cantilever 600 psf

2.3	0.0	0.0	0.0	245.3	7243.8	245.3	7243.8
2.0	0.0	0.0	0.0	253.1	7473.7	253.1	7473.7
1.3	43.7	0.0	0.0	305.4	7773.8	261.7	7730.1
0.3	106.1	0.0	0.0	380.2	8202.6	274.2	8096.5
0.0	124.8	0.0	0.0	402.7	8331.2	277.9	8206.4
-0.7	124.8	0.0	0.0	411.4	8587.7	286.6	8462.9
-1.7	124.8	0.0	0.0	423.8	8954.0	299.0	8829.2
-2.7	124.8	0.0	0.0	436.2	9320.4	311.4	9195.6
-3.6+	124.8	0.0	0.0	447.3	9650.1	322.5	9525.3
-3.6-	124.8	0.0	0.0	487.5	7597.0	362.7	7472.2
-3.7	124.8	0.0	0.0	488.8	7623.0	364.0	7498.2
-4.7	124.8	0.0	0.0	501.4	7883.1	376.6	7758.3
-5.7	124.8	0.0	0.0	514.0	8143.2	389.2	8018.4
-6.7	124.8	0.0	0.0	526.6	8403.2	401.8	8278.4
-7.7	124.8	0.0	0.0	539.3	8663.3	414.5	8538.5
-8.7	124.8	0.0	0.0	551.9	8923.4	427.1	8798.6
-9.7	124.8	0.0	0.0	564.5	9183.5	439.7	9058.7
-10.7	124.8	0.0	0.0	577.1	9443.6	452.3	9318.8
-11.7	124.8	0.0	0.0	589.8	9703.6	465.0	9578.8
-12.7	124.8	0.0	0.0	602.4	9963.7	477.6	9838.9
-13.7	124.8	0.0	0.0	615.0	10223.8	490.2	10099.0
-14.7	124.8	0.0	0.0	627.6	10483.9	502.8	10359.1
-15.7	124.8	0.0	0.0	640.3	10744.0	515.5	10619.2
-16.0	124.8	0.0	0.0	644.1	10822.0	519.3	10697.2
-16.7	124.8	182.1	8.8	470.8	10995.2	528.1	10879.2
-17.0	124.8	260.1	12.6	396.6	11069.4	531.9	10957.3
-17.7	124.8	442.1	21.5	223.4	11242.7	540.7	11139.3
-18.6	124.8	676.9	32.9	0.0	11466.0	552.1	11374.1
-18.7	124.8	702.2	34.1	-24.1	11490.1	553.3	11399.4
-19.7	124.8	962.3	46.7	-271.5	11737.6	566.0	11659.5
-20.7	124.8	1222.4	59.3	-519.0	11985.0	578.6	11919.6
-21.7	124.8	1482.5	72.0	-766.4	12232.5	591.2	12179.6
-22.2+	124.8	1612.5	78.3	-12530.2	19367.0	597.5	12309.7
-22.2-	124.8	24295.1	0.0	-12530.2	19367.0	0.0	26252.9
-22.7	124.8	24326.4	0.0	-24201.6	26409.0	0.0	26284.2
-23.7	124.8	24389.0	0.0	-24264.2	26471.6	0.0	26346.8
-24.7	124.8	24451.6	0.0	-24326.8	26534.2	0.0	26409.4
-25.7	124.8	24514.2	0.0	-24389.4	26596.8	0.0	26472.0
-26.7	124.8	24576.8	0.0	-24452.0	26659.4	0.0	26534.6
-27.7	124.8	24639.4	0.0	-24514.6	26722.0	0.0	26597.2
-28.7	124.8	24702.0	0.0	-24577.2	26784.6	0.0	26659.8
-29.7	124.8	24764.6	0.0	-24639.8	26847.2	0.0	26722.4
-30.7	124.8	24827.2	0.0	-24702.4	26909.8	0.0	26785.0
-31.7	124.8	24889.8	0.0	-24765.0	26972.4	0.0	26847.6
-32.7	124.8	24952.4	0.0	-24827.6	27035.0	0.0	26910.2
-33.7	124.8	25015.0	0.0	-24890.2	27097.6	0.0	26972.8
-34.7	124.8	25077.6	0.0	-24952.8	27160.2	0.0	27035.4
-35.7	124.8	25140.2	0.0	-25015.4	27222.8	0.0	27098.0
-36.7	124.8	25202.8	0.0	-25078.0	27285.4	0.0	27160.6
-37.7	124.8	25265.4	0.0	-25140.6	27348.0	0.0	27223.2
-38.7	124.8	25328.0	0.0	-25203.2	27410.6	0.0	27285.8
-39.7	124.8	25390.6	0.0	-25265.8	27473.2	0.0	27348.4
-40.7	124.8	25453.2	0.0	-25328.4	27535.8	0.0	27411.0
-41.7	124.8	25515.8	0.0	-25391.0	27598.4	0.0	27473.6
-42.7	124.8	25578.4	0.0	-25453.6	27661.0	0.0	27536.2
-43.7	124.8	25641.0	0.0	-25516.2	27723.6	0.0	27598.8
-44.7	124.8	25703.6	0.0	-25578.8	27786.2	0.0	27661.4
-45.7	124.8	25766.2	0.0	-25641.4	27848.8	0.0	27724.0
-46.7	124.8	25828.8	0.0	-25704.0	27911.4	0.0	27786.6
-47.7	124.8	25891.4	0.0	-25766.6	27974.0	0.0	27849.2
-48.7	124.8	25954.0	0.0	-25829.2	28036.6	0.0	27911.8
-49.7	124.8	26016.6	0.0	-25891.8	28099.2	0.0	27974.4
-50.7	124.8	26079.2	0.0	-25954.4	28161.8	0.0	28037.0

Cantilever 600 psf

-51.7	124.8	26141.8	0.0	-26017.0	28224.4	0.0	28099.6
-52.7	124.8	26204.4	0.0	-26079.6	28287.0	0.0	28162.2
-53.7	124.8	26267.0	0.0	-26142.2	28349.6	0.0	28224.8
-54.7	124.8	26329.6	0.0	-26204.8	28412.2	0.0	28287.4
-55.7	124.8	26392.2	0.0	-26267.4	28474.8	0.0	28350.0
-56.7	124.8	26454.8	0.0	-26330.0	28537.4	0.0	28412.6
-57.7	124.8	26517.4	0.0	-26392.6	28600.0	0.0	28475.2
-58.7	124.8	26580.0	0.0	-26455.2	28662.6	0.0	28537.8
-59.7	124.8	26642.6	0.0	-26517.8	28725.2	0.0	28600.4
-60.7	124.8	26705.2	0.0	-26580.4	28787.8	0.0	28663.0
-61.7	124.8	26767.8	0.0	-26643.0	28850.4	0.0	28725.6
-62.7	124.8	26830.4	0.0	-26705.6	28913.0	0.0	28788.2
-63.7	124.8	26893.0	0.0	-26768.2	28975.6	0.0	28850.8
-64.7	124.8	26955.6	0.0	-26830.8	29038.2	0.0	28913.4
-65.7	124.8	27018.2	0.0	-26893.4	29100.8	0.0	28976.0
-66.7	124.8	27080.8	0.0	-26956.0	29163.4	0.0	29038.6
-67.7	124.8	27143.4	0.0	-27018.6	29226.0	0.0	29101.2
-68.7	124.8	27206.0	0.0	-27081.2	29288.6	0.0	29163.8
-69.7	124.8	27268.6	0.0	-27143.8	29351.2	0.0	29226.4
-70.7	124.8	27331.2	0.0	-27206.4	29413.8	0.0	29289.0
-71.7	124.8	27393.8	0.0	-27269.0	29476.4	0.0	29351.6
-72.7	124.8	27456.4	0.0	-27331.6	29539.0	0.0	29414.2
-73.7	124.8	27519.0	0.0	-27394.2	29601.6	0.0	29476.8
-74.7	124.8	27581.6	0.0	-27456.8	29664.2	0.0	29539.4
-75.7	124.8	27644.2	0.0	-27519.4	29726.8	0.0	29602.0
-76.7	124.8	27706.8	0.0	-27582.0	29789.4	0.0	29664.6
-77.7	124.8	27769.4	0.0	-27644.6	29852.0	0.0	29727.2
-78.7	124.8	27832.0	0.0	-27707.2	29914.6	0.0	29789.8
-79.7	124.8	27894.6	0.0	-27769.8	29977.2	0.0	29852.4
-80.7	124.8	27957.2	0.0	-27832.4	30039.8	0.0	29915.0
-81.7	124.8	28019.8	0.0	-27895.0	30102.4	0.0	29977.6
-82.7	124.8	28082.4	0.0	-27957.6	30165.0	0.0	30040.2
-83.7	124.8	28145.0	0.0	-28020.2	30227.6	0.0	30102.8

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 14:56:05

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

WALL BOTTOM ELEV. (FT) : -28.53
PENETRATION (FT) : 12.53

MAX. BEND. MOMENT (LB-FT) : 1.5687E+05
AT ELEVATION (FT) : -22.58

MAX. SCALED DEFL. (LB-IN^3): 7.9360E+10
AT ELEVATION (FT) : 6.30

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 18-AUGUST-2010 TIME: 14:56:05

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--RESULTS0. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
6.30	0.0000E+00	0.	7.9360E+10	141.51
5.30	7.5077E+01	154.	7.6109E+10	167.45
4.30	3.1760E+02	335.	7.2859E+10	193.39
3.30	7.5353E+02	541.	6.9608E+10	219.34
2.30	1.4088E+03	774.	6.6360E+10	245.28
2.00	1.6520E+03	848.	6.5385E+10	253.06
1.30	2.3121E+03	1044.	6.3113E+10	305.43
0.30	3.5211E+03	1387.	5.9871E+10	380.23
0.00	3.9545E+03	1504.	5.8900E+10	402.67
-0.70	5.1067E+03	1789.	5.6635E+10	411.36
-1.70	7.1034E+03	2207.	5.3408E+10	423.76
-2.70	9.5239E+03	2636.	5.0193E+10	436.17
-3.60	1.2075E+04	3034.	4.7313E+10	447.33
-3.60	1.2075E+04	3034.	4.7313E+10	487.51
-3.70	1.2381E+04	3083.	4.6994E+10	488.78
-4.70	1.5710E+04	3578.	4.3817E+10	501.40
-5.70	1.9541E+04	4086.	4.0668E+10	514.03
-6.70	2.3886E+04	4606.	3.7552E+10	526.65
-7.70	2.8757E+04	5139.	3.4477E+10	539.27
-8.70	3.4168E+04	5685.	3.1453E+10	551.90
-9.70	4.0131E+04	6243.	2.8487E+10	564.52
-10.70	4.6658E+04	6814.	2.5591E+10	577.15
-11.70	5.3762E+04	7397.	2.2775E+10	589.77
-12.70	6.1456E+04	7993.	2.0053E+10	602.40
-13.70	6.9752E+04	8602.	1.7437E+10	615.02
-14.70	7.8664E+04	9223.	1.4941E+10	627.65

-15.70	8.8203E+04	9857.	1.2581E+10	640.27
-16.00	9.1189E+04	10050.	1.1902E+10	644.06
-16.70	9.8368E+04	10440.	1.0374E+10	470.84
-17.00	1.0152E+05	10570.	9.7445E+09	396.60
-17.70	1.0900E+05	10787.	8.3373E+09	223.39
-18.60	1.1880E+05	10888.	6.6597E+09	0.00
-18.70	1.1986E+05	10887.	6.4886E+09	-24.07
-19.70	1.3069E+05	10739.	4.8471E+09	-271.53
-20.70	1.4126E+05	10344.	3.4314E+09	-518.98
-21.70	1.5130E+05	9701.	2.2597E+09	-766.44
-22.20	1.5556E+05	6377.	1.7707E+09	-12530.24
-22.70	1.5670E+05	-2806.	1.3489E+09	-24201.62
-22.88	1.5578E+05	-7227.	1.2117E+09	-24213.05
-23.70	1.4261E+05	-24001.	7.0588E+08	-16830.19
-24.70	1.1170E+05	-36315.	3.0684E+08	-7797.58
-25.70	7.2990E+04	-39596.	9.9691E+07	1235.04
-26.70	3.5517E+04	-33845.	1.8846E+07	10267.66
-27.70	8.3117E+03	-19061.	8.5299E+05	19300.28
-28.53	0.0000E+00	0.	0.0000E+00	26773.81

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

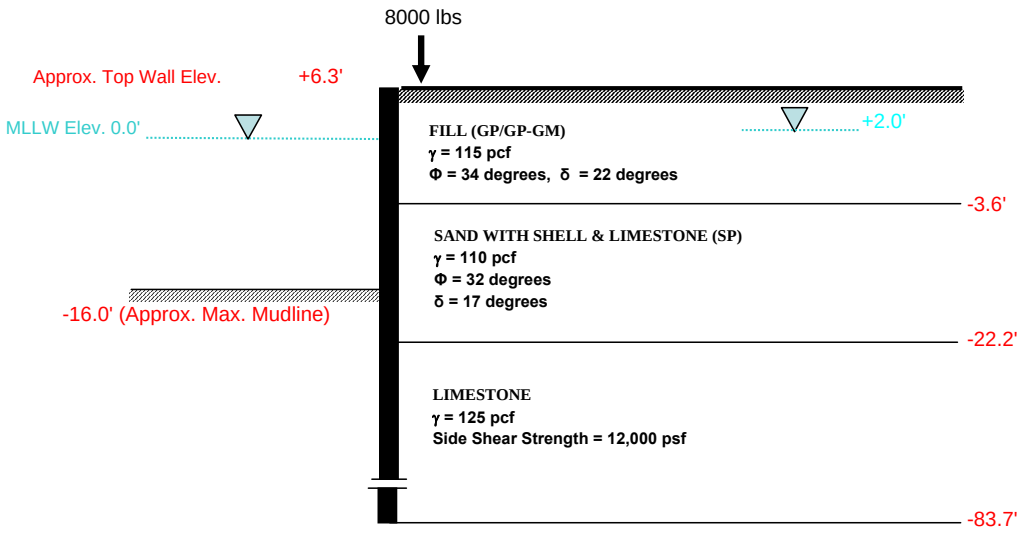
		<----------SOIL PRESSURES---------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
6.30	0.	0.	0.	142.	4179.
5.30	0.	0.	0.	167.	4945.
4.30	0.	0.	0.	193.	5711.
3.30	0.	0.	0.	219.	6478.
2.30	0.	0.	0.	245.	7244.
2.00	0.	0.	0.	253.	7474.
1.30	44.	0.	0.	262.	7730.
0.30	106.	0.	0.	274.	8096.
0.00	125.	0.	0.	278.	8206.
-0.70	125.	0.	0.	287.	8463.
-1.70	125.	0.	0.	299.	8829.
-2.70	125.	0.	0.	311.	9196.
-3.60+	125.	0.	0.	323.	9525.
-3.60+	125.	0.	0.	363.	7472.
-3.70	125.	0.	0.	364.	7498.
-4.70	125.	0.	0.	377.	7758.
-5.70	125.	0.	0.	389.	8018.
-6.70	125.	0.	0.	402.	8278.
-7.70	125.	0.	0.	414.	8539.
-8.70	125.	0.	0.	427.	8799.
-9.70	125.	0.	0.	440.	9059.
-10.70	125.	0.	0.	452.	9319.
-11.70	125.	0.	0.	465.	9579.
-12.70	125.	0.	0.	478.	9839.
-13.70	125.	0.	0.	490.	10099.
-14.70	125.	0.	0.	503.	10359.
-15.70	125.	0.	0.	515.	10619.
-16.00	125.	0.	0.	519.	10697.
-16.70	125.	182.	9.	528.	10879.
-17.00	125.	260.	13.	532.	10957.
-17.70	125.	442.	21.	541.	11139.
-18.60	125.	677.	33.	552.	11374.

Cantilever 600 psf

-18.70	125.	702.	34.	553.	11399.
-19.70	125.	962.	47.	566.	11659.
-20.70	125.	1222.	59.	579.	11920.
-21.70	125.	1482.	72.	591.	12180.
-22.20+	125.	1612.	78.	598.	12310.
-22.20+	125.	24295.	0.	0.	26253.
-22.70	125.	24326.	0.	0.	26284.
-22.88	125.	24338.	0.	0.	26296.
-23.70	125.	24389.	0.	0.	26347.
-24.70	125.	24452.	0.	0.	26409.
-25.70	125.	24514.	0.	0.	26472.
-26.70	125.	24577.	0.	0.	26535.
-27.70	125.	24639.	0.	0.	26597.
-28.53	125.	24702.	0.	0.	26660.
-29.70	125.	24765.	0.	0.	26722.

Key West Naval Air Station (Breakwater 497)
Truman Annex, Key West, Florida
N&A Project No. 08-09-0021-101

CASE III: **Steel Sheet Pile Bulkhead, Cantilever (Sta. 12+90 to 16+46)**



Input from CWALSHT Output

(Calculated) Wall Penetration (ft) = 13.08 → Elevation (ft) = **-30.00**
(Required) Wall Penetration (ft)= **19.0** → Elevation (ft) = **-35.00**

Maximum Bending Moment, Mmax (Kips-ft) = 183.46

Nominal Yield Strength for Grade A-328 Steel (ksi) 39
Allowable Working Stress for Grade A-328 Steel, Fb (ksi) = 60% * 39 = 23.4

Nominal Yield Strength for Grade A-572 Steel (ksi) 50
Allowable Working Stress for Grade A-572 Steel, Fb (ksi) = 60% * 50 = 30

Required Section Modulus, S (in^3) for A-328 = Mmax / Fb = **94.1**
Required Section Modulus, S (in^3) for A-572 = Mmax / Fb = **73.4**

Scaled Deflection ($lbs\text{-}in^3$) 9.93080E+10

Section	*Section Modulus (in^3/ft)*	*Moment of Inertia (in^4/ft)*	*Deflection (in)*
AZ-25	45.7	382.6	-
AZ-26	48.4	406.5	-
AZ-28	51.2	431.6	-
AZ-37	68.9	676.6	-
AZ-39	72.5	714	-
AZ-41	76.2	751.4	4.56
AZ-46	85.5	808.8	4.23
AZ-48	89.3	847.1	4.04
AZ-50	93.3	886.5	3.86

*The sheet pile section was selected to estimate the top wall deflection. The actual sheet pile section should be selected by The Designer.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 15:00:44

****
* INPUT DATA *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 6.30 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
100.00	6.30

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
100.00	-16.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
115.00	110.00	34.00	0.00	22.00	0.00	-3.60	0.00	DEF	DEF
110.00	105.00	32.00	0.00	17.00	0.00	-22.20	0.00	DEF	DEF
125.00	120.00	0.00	12000.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
110.00	105.00	32.00	0.00	17.00	0.00	-22.20	0.00	DEF	DEF
125.00	120.00	0.00	12000.00	0.00	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 2.00 (FT)
LEFTSIDE ELEVATION = 0.00 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

VII.A.--VERTICAL LINE LOADS

VII.A.1.--RIGHTSIDE

DIST. FROM WALL (FT)	LINE LOAD (PLF)
1.00	8000.00

VII.A.2.--LEFTSIDE
NONE

VII.B.--VERTICAL UNIFORM LOADS
NONE

VII.C.--VERTICAL STRIP LOADS
NONE

VII.D.--VERTICAL RAMP LOADS
NONE

VII.E.--VERTICAL TRIANGULAR LOADS
NONE

VII.F.--VERTICAL VARIABLE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 15:00:46

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

ELEV.	NET WATER	<---LEFTSIDE---> PASSIVE	ACTIVE	<------NET------> (SOIL + WATER) ACTIVE	PASSIVE	<--RIGHTSIDE---> ACTIVE	PASSIVE

Cantilever Point Load

(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.3	0.0	0.0	0.0	150.4	890.6	150.4	890.6
4.3	0.0	0.0	0.0	283.2	1763.6	283.2	1763.6
3.3	0.0	0.0	0.0	386.7	2607.4	386.7	2607.4
2.3	0.0	0.0	0.0	457.5	3418.4	457.5	3418.4
2.0	0.0	0.0	0.0	472.7	3655.7	472.7	3655.7
1.3	43.7	0.0	0.0	533.2	3964.0	489.5	3920.3
0.3	106.1	0.0	0.0	601.5	4386.3	495.5	4280.2
0.0	124.8	0.0	0.0	618.9	4509.8	494.1	4385.0
-0.7	124.8	0.0	0.0	611.9	4750.5	487.1	4625.7
-1.7	124.8	0.0	0.0	595.7	5088.4	470.9	4963.6
-2.7	124.8	0.0	0.0	576.6	5423.2	451.8	5298.4
-3.6+	124.8	0.0	0.0	559.4	5724.6	434.6	5599.8
-3.6-	124.8	0.0	0.0	581.9	4572.2	457.1	4447.4
-3.7	124.8	0.0	0.0	580.1	4595.1	455.3	4470.3
-4.7	124.8	0.0	0.0	563.1	4825.6	438.3	4700.8
-5.7	124.8	0.0	0.0	548.8	5058.7	424.0	4933.9
-6.7	124.8	0.0	0.0	537.4	5294.8	412.6	5170.0
-7.7	124.8	0.0	0.0	529.0	5533.9	404.2	5409.1
-8.7	124.8	0.0	0.0	523.4	5775.7	398.6	5650.9
-9.7	124.8	0.0	0.0	520.1	6019.9	395.3	5895.1
-10.7	124.8	0.0	0.0	519.1	6266.3	394.3	6141.5
-11.7	124.8	0.0	0.0	519.9	6514.6	395.1	6389.8
-12.7	124.8	0.0	0.0	522.3	6764.4	397.5	6639.6
-13.7	124.8	0.0	0.0	526.1	7015.7	401.3	6890.9
-14.7	124.8	0.0	0.0	531.1	7268.1	406.3	7143.3
-15.7	124.8	0.0	0.0	537.1	7521.6	412.3	7396.8
-16.0	124.8	0.0	0.0	539.0	7597.8	414.2	7473.0
-16.7	124.8	182.1	8.8	361.9	7767.0	419.1	7651.1
-17.0	124.8	260.1	12.6	286.0	7839.7	421.3	7727.5
-17.7	124.8	442.1	21.5	109.3	8009.4	426.7	7906.1
-18.1	124.8	555.0	26.9	0.0	8114.9	430.2	8017.1
-18.7	124.8	702.2	34.1	-142.5	8252.5	434.9	8161.7
-19.7	124.8	962.3	46.7	-393.9	8496.0	443.6	8417.9
-20.7	124.8	1222.4	59.3	-644.8	8740.0	452.8	8674.6
-21.7	124.8	1482.5	72.0	-895.3	8984.5	462.4	8931.6
-22.2+	124.8	1612.5	78.3	-12595.3	17456.7	467.3	9060.3
-22.2-	124.8	24295.1	0.0	-12595.3	17456.7	0.0	25681.9
-22.7	124.8	24326.4	0.0	-24201.6	25836.7	0.0	25711.9
-23.7	124.8	24389.0	0.0	-24264.2	25896.9	0.0	25772.1
-24.7	124.8	24451.6	0.0	-24326.8	25957.3	0.0	25832.5
-25.7	124.8	24514.2	0.0	-24389.4	26018.0	0.0	25893.2
-26.7	124.8	24576.8	0.0	-24452.0	26078.9	0.0	25954.1
-27.7	124.8	24639.4	0.0	-24514.6	26140.0	0.0	26015.2
-28.7	124.8	24702.0	0.0	-24577.2	26201.2	0.0	26076.4
-29.7	124.8	24764.6	0.0	-24639.8	26262.6	0.0	26137.8
-30.7	124.8	24827.2	0.0	-24702.4	26324.1	0.0	26199.3
-31.7	124.8	24889.8	0.0	-24765.0	26385.6	0.0	26260.8
-32.7	124.8	24952.4	0.0	-24827.6	26447.3	0.0	26322.5
-33.7	124.8	25015.0	0.0	-24890.2	26509.1	0.0	26384.3
-34.7	124.8	25077.6	0.0	-24952.8	26570.9	0.0	26446.1
-35.7	124.8	25140.2	0.0	-25015.4	26632.8	0.0	26508.0
-36.7	124.8	25202.8	0.0	-25078.0	26694.8	0.0	26570.0
-37.7	124.8	25265.4	0.0	-25140.6	26756.8	0.0	26632.0
-38.7	124.8	25328.0	0.0	-25203.2	26818.8	0.0	26694.0
-39.7	124.8	25390.6	0.0	-25265.8	26880.9	0.0	26756.1
-40.7	124.8	25453.2	0.0	-25328.4	26943.1	0.0	26818.3
-41.7	124.8	25515.8	0.0	-25391.0	27005.2	0.0	26880.4
-42.7	124.8	25578.4	0.0	-25453.6	27067.5	0.0	26942.7
-43.7	124.8	25641.0	0.0	-25516.2	27129.7	0.0	27004.9
-44.7	124.8	25703.6	0.0	-25578.8	27192.0	0.0	27067.2
-45.7	124.8	25766.2	0.0	-25641.4	27254.2	0.0	27129.4

Cantilever Point Load

-46.7	124.8	25828.8	0.0	-25704.0	27316.5	0.0	27191.7
-47.7	124.8	25891.4	0.0	-25766.6	27378.9	0.0	27254.1
-48.7	124.8	25954.0	0.0	-25829.2	27441.2	0.0	27316.4
-49.7	124.8	26016.6	0.0	-25891.8	27503.6	0.0	27378.8
-50.7	124.8	26079.2	0.0	-25954.4	27566.0	0.0	27441.2
-51.7	124.8	26141.8	0.0	-26017.0	27628.4	0.0	27503.6
-52.7	124.8	26204.4	0.0	-26079.6	27690.8	0.0	27566.0
-53.7	124.8	26267.0	0.0	-26142.2	27753.2	0.0	27628.4
-54.7	124.8	26329.6	0.0	-26204.8	27815.6	0.0	27690.8
-55.7	124.8	26392.2	0.0	-26267.4	27878.1	0.0	27753.3
-56.7	124.8	26454.8	0.0	-26330.0	27940.5	0.0	27815.7
-57.7	124.8	26517.4	0.0	-26392.6	28003.0	0.0	27878.2
-58.7	124.8	26580.0	0.0	-26455.2	28065.5	0.0	27940.7
-59.7	124.8	26642.6	0.0	-26517.8	28127.9	0.0	28003.1
-60.7	124.8	26705.2	0.0	-26580.4	28190.4	0.0	28065.6
-61.7	124.8	26767.8	0.0	-26643.0	28252.9	0.0	28128.1
-62.7	124.8	26830.4	0.0	-26705.6	28315.4	0.0	28190.6
-63.7	124.8	26893.0	0.0	-26768.2	28377.9	0.0	28253.1
-64.7	124.8	26955.6	0.0	-26830.8	28440.4	0.0	28315.6
-65.7	124.8	27018.2	0.0	-26893.4	28502.9	0.0	28378.1
-66.7	124.8	27080.8	0.0	-26956.0	28565.4	0.0	28440.6
-67.7	124.8	27143.4	0.0	-27018.6	28628.0	0.0	28503.2
-68.7	124.8	27206.0	0.0	-27081.2	28690.5	0.0	28565.7
-69.7	124.8	27268.6	0.0	-27143.8	28753.0	0.0	28628.2
-70.7	124.8	27331.2	0.0	-27206.4	28815.5	0.0	28690.7
-71.7	124.8	27393.8	0.0	-27269.0	28878.1	0.0	28753.3
-72.7	124.8	27456.4	0.0	-27331.6	28940.6	0.0	28815.8
-73.7	124.8	27519.0	0.0	-27394.2	29003.2	0.0	28878.4
-74.7	124.8	27581.6	0.0	-27456.8	29065.7	0.0	28940.9
-75.7	124.8	27644.2	0.0	-27519.4	29128.3	0.0	29003.5
-76.7	124.8	27706.8	0.0	-27582.0	29190.8	0.0	29066.0
-77.7	124.8	27769.4	0.0	-27644.6	29253.4	0.0	29128.6
-78.7	124.8	27832.0	0.0	-27707.2	29315.9	0.0	29191.1
-79.7	124.8	27894.6	0.0	-27769.8	29378.5	0.0	29253.7
-80.7	124.8	27957.2	0.0	-27832.4	29441.0	0.0	29316.2
-81.7	124.8	28019.8	0.0	-27895.0	29503.6	0.0	29378.8
-82.7	124.8	28082.4	0.0	-27957.6	29566.1	0.0	29441.3
-83.7	124.8	28145.0	0.0	-28020.2	29628.7	0.0	29503.9

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 15:00:47

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

WALL BOTTOM ELEV. (FT) : -29.08
PENETRATION (FT) : 13.08

MAX. BEND. MOMENT (LB-FT) : 1.8346E+05
AT ELEVATION (FT) : -22.59

MAX. SCALED DEFL. (LB-IN^3): 9.9308E+10
AT ELEVATION (FT) : 6.30

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 15:00:47

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--RESULTS0. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
6.30	0.0000E+00	0.	9.9308E+10	0.00
5.30	2.5060E+01	75.	9.5217E+10	150.36
4.30	1.9756E+02	292.	9.1125E+10	283.18
3.30	6.4835E+02	627.	8.7034E+10	386.70
2.30	1.4804E+03	1049.	8.2945E+10	457.48
2.00	1.8159E+03	1189.	8.1718E+10	472.73
1.30	2.7686E+03	1541.	7.8857E+10	533.22
0.30	4.5872E+03	2108.	7.4775E+10	601.54
0.00	5.2469E+03	2291.	7.3552E+10	618.91
-0.70	7.0017E+03	2722.	7.0701E+10	611.86
-1.70	1.0027E+04	3326.	6.6639E+10	595.71
-2.70	1.3647E+04	3912.	6.2594E+10	576.58
-3.60	1.7399E+04	4423.	5.8974E+10	559.37
-3.60	1.7399E+04	4423.	5.8974E+10	581.93
-3.70	1.7844E+04	4481.	5.8573E+10	580.10
-4.70	2.2612E+04	5053.	5.4583E+10	563.10
-5.70	2.7944E+04	5609.	5.0632E+10	548.78
-6.70	3.3825E+04	6152.	4.6729E+10	537.44
-7.70	4.0244E+04	6685.	4.2885E+10	529.03
-8.70	4.7193E+04	7211.	3.9111E+10	523.36
-9.70	5.4665E+04	7733.	3.5418E+10	520.14

-10.70	6.2658E+04	8252.	3.1820E+10	519.08
-11.70	7.1170E+04	8772.	2.8330E+10	519.89
-12.70	8.0202E+04	9293.	2.4963E+10	522.32
-13.70	8.9757E+04	9817.	2.1735E+10	526.12
-14.70	9.9838E+04	10346.	1.8662E+10	531.10
-15.70	1.1045E+05	10880.	1.5761E+10	537.08
-16.00	1.1374E+05	11041.	1.4928E+10	539.05
-16.70	1.2159E+05	11357.	1.3052E+10	361.86
-17.00	1.2501E+05	11454.	1.2279E+10	286.03
-17.70	1.3308E+05	11592.	1.0552E+10	109.35
-18.13	1.3812E+05	11616.	9.5378E+09	0.00
-18.70	1.4469E+05	11576.	8.2831E+09	-142.53
-19.70	1.5615E+05	11307.	6.2637E+09	-393.88
-20.70	1.6722E+05	10788.	4.5141E+09	-644.77
-21.70	1.7764E+05	10018.	3.0533E+09	-895.25
-22.20	1.8205E+05	6645.	2.4369E+09	-12595.34
-22.70	1.8332E+05	-2554.	1.8991E+09	-24201.62
-22.85	1.8264E+05	-6272.	1.7498E+09	-24211.23
-23.70	1.6948E+05	-23864.	1.0585E+09	-17358.39
-24.70	1.3828E+05	-37174.	5.0828E+08	-9262.06
-25.70	9.7825E+04	-42388.	1.9567E+08	-1165.73
-26.70	5.6204E+04	-39506.	5.1936E+07	6930.60
-27.70	2.1512E+04	-28527.	6.3191E+06	15026.93
-28.70	1.8483E+03	-9452.	3.9698E+04	23123.26
-29.08	0.0000E+00	0.	0.0000E+00	26224.73

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

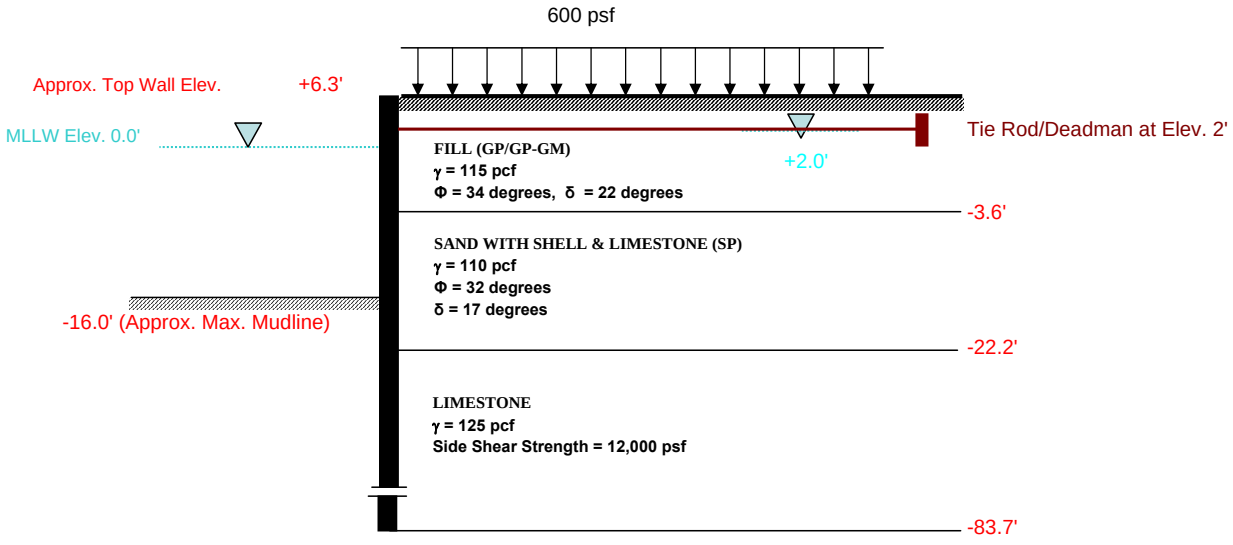
		<----------SOIL PRESSURES---------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
6.30	0.	0.	0.	0.	0.
5.30	0.	0.	0.	150.	891.
4.30	0.	0.	0.	283.	1764.
3.30	0.	0.	0.	387.	2607.
2.30	0.	0.	0.	457.	3418.
2.00	0.	0.	0.	473.	3656.
1.30	44.	0.	0.	490.	3920.
0.30	106.	0.	0.	495.	4280.
0.00	125.	0.	0.	494.	4385.
-0.70	125.	0.	0.	487.	4626.
-1.70	125.	0.	0.	471.	4964.
-2.70	125.	0.	0.	452.	5298.
-3.60+	125.	0.	0.	435.	5600.
-3.60+	125.	0.	0.	457.	4447.
-3.70	125.	0.	0.	455.	4470.
-4.70	125.	0.	0.	438.	4701.
-5.70	125.	0.	0.	424.	4934.
-6.70	125.	0.	0.	413.	5170.
-7.70	125.	0.	0.	404.	5409.
-8.70	125.	0.	0.	399.	5651.
-9.70	125.	0.	0.	395.	5895.
-10.70	125.	0.	0.	394.	6141.
-11.70	125.	0.	0.	395.	6390.
-12.70	125.	0.	0.	398.	6640.
-13.70	125.	0.	0.	401.	6891.
-14.70	125.	0.	0.	406.	7143.

Cantilever Point Load

-15.70	125.	0.	0.	412.	7397.
-16.00	125.	0.	0.	414.	7473.
-16.70	125.	182.	9.	419.	7651.
-17.00	125.	260.	13.	421.	7728.
-17.70	125.	442.	21.	427.	7906.
-18.13	125.	555.	27.	430.	8017.
-18.70	125.	702.	34.	435.	8162.
-19.70	125.	962.	47.	444.	8418.
-20.70	125.	1222.	59.	453.	8675.
-21.70	125.	1482.	72.	462.	8932.
-22.20+	125.	1612.	78.	467.	9060.
-22.20+	125.	24295.	0.	0.	25682.
-22.70	125.	24326.	0.	0.	25712.
-22.85	125.	24336.	0.	0.	25721.
-23.70	125.	24389.	0.	0.	25772.
-24.70	125.	24452.	0.	0.	25833.
-25.70	125.	24514.	0.	0.	25893.
-26.70	125.	24577.	0.	0.	25954.
-27.70	125.	24639.	0.	0.	26015.
-28.70	125.	24702.	0.	0.	26076.
-29.08	125.	24765.	0.	0.	26138.
-30.70	125.	24827.	0.	0.	26199.

Key West Naval Air Station (Breakwater 497)
Truman Annex, Key West, Florida
N&A Project No. 08-09-0021-101

CASE IV: **Steel Sheet Pile Bulkhead, Anchored/Deadman (Sta. 12+90 to 16+46)**



Input from CWALSHT Output

(Calculated) Wall Penetration (ft) =	7.89	→ Elevation (ft) =	**-24.00**
(Required) Wall Penetration (ft)=	**12.0**	→ Elevation (ft) =	**-28.00**

Maximum Bending Moment, Mmax (Kips-ft) = 28.184

Anchor Force (kips) = 5.26

Nominal Yield Strength for Grade A-328 Steel (ksi) 39
Allowable Working Stress for Grade A-328 Steel, Fb (ksi) = 60% * 39 = 23.4

Nominal Yield Strength for Grade A-572 Steel (ksi) 50
Allowable Working Stress for Grade A-572 Steel, Fb (ksi) = 60% * 50 = 30

Required Section Modulus, S (in^3) for A-328 = Mmax / Fb = **14.5**
Required Section Modulus, S (in^3) for A-572 = Mmax / Fb = **11.3**

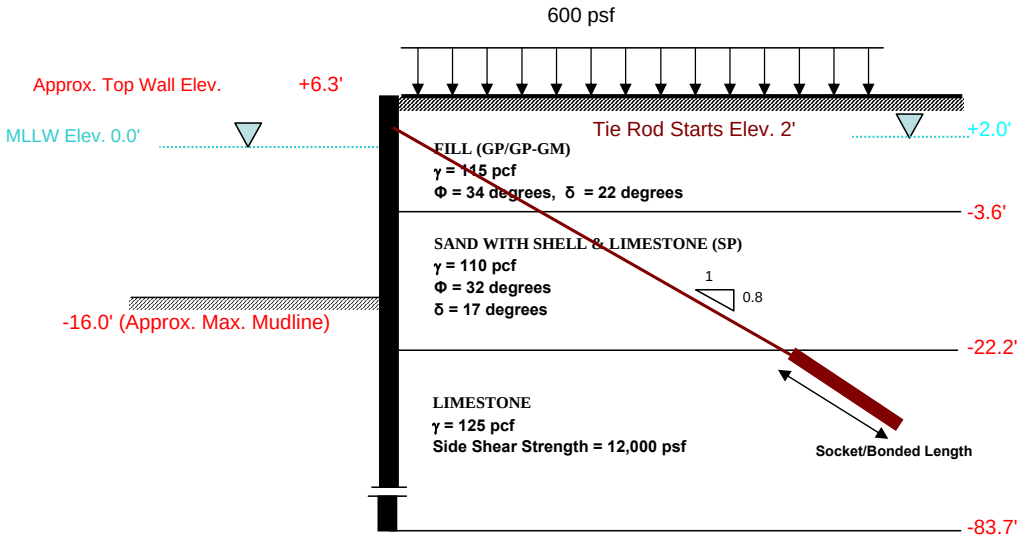
Scaled Deflection ($lbs\text{-}in^3$) 1.85560E+09

Section	*Section Modulus (in^3/ft)*	*Moment of Inertia (in^4/ft)*	*Deflection (in)*
AZ-12	22.3	132.8	0.48
AZ-18	33.5	250.4	0.26
AZ-26	48.4	406.5	0.16
AZ-37	68.9	676.6	0.09
AZ-39	72.5	714	0.09
AZ-41	76.2	751.4	0.09
AZ-46	85.5	808.8	0.08
AZ-48	89.3	847.1	0.08
AZ-50	93.3	886.5	0.07

*The sheet pile section was selected to estimate the top wall deflection. The actual sheet pile section should be selected by The Designer.

Key West Naval Air Station (Breakwater 497)
Truman Annex, Key West, Florida
N&A Project No. 08-09-0021-101

CASE IV: **Steel Sheet Pile Bulkhead, Anchored to Limestone (Sta. 12+90 to 16+46)**



Input from CWALSHT Output

(Calculated) Wall Penetration (ft) =	7.89	→ Elevation (ft) =	**-24.00**
(Required) Wall Penetration (ft)=	**12.0**	→ Elevation (ft) =	**-28.00**

Maximum Bending Moment, Mmax (Kips-ft) = 28.184

Anchor Force (kips) = 5.26

Nominal Yield Strength for Grade A-328 Steel (ksi) 39
Allowable Working Stress for Grade A-328 Steel, Fb (ksi) = 60% * 39 = 23.4

Nominal Yield Strength for Grade A-572 Steel (ksi) 50
Allowable Working Stress for Grade A-572 Steel, Fb (ksi) = 60% * 50 = 30

Required Section Modulus, S (in^3) for A-328 = Mmax / Fb = **14.5**
Required Section Modulus, S (in^3) for A-572 = Mmax / Fb = **11.3**

Scaled Deflection ($lbs\text{-}in^3$) 1.85560E+09

Section	*Section Modulus (in^3/ft)*	*Moment of Inertia (in^4/ft)*	*Deflection (in)*
AZ-12	22.3	132.8	0.48
AZ-18	33.5	250.4	0.26
AZ-26	48.4	406.5	0.16
AZ-37	68.9	676.6	0.09
AZ-39	72.5	714	0.09
AZ-41	76.2	751.4	0.09
AZ-46	85.5	808.8	0.08
AZ-48	89.3	847.1	0.08
AZ-50	93.3	886.5	0.07

*The sheet pile section was selected to estimate the top wall deflection. The actual sheet pile section should be selected by The Designer.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 15:04:30

****
* INPUT DATA *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--CONTROL
ANCHORED WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 6.30 FT.
ELEVATION AT ANCHOR = 2.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
100.00	6.30

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
100.00	-16.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
115.00	110.00	34.00	0.00	22.00	0.00	-3.60	0.00	DEF	DEF
110.00	105.00	32.00	0.00	17.00	0.00	-22.20	0.00	DEF	DEF
125.00	120.00	0.00	12000.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
110.00	105.00	32.00	0.00	17.00	0.00	-22.20	0.00	DEF	DEF
125.00	120.00	0.00	12000.00	0.00	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 2.00 (FT)
LEFTSIDE ELEVATION = 0.00 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

VII.A.--VERTICAL LINE LOADS
NONE

VII.B.--VERTICAL UNIFORM LOADS

LEFTSIDE (PSF)	RIGHTSIDE (PSF)
0.00	600.00

VII.C.--VERTICAL STRIP LOADS
NONE

VII.D.--VERTICAL RAMP LOADS
NONE

VII.E.--VERTICAL TRIANGULAR LOADS
NONE

VII.F.--VERTICAL VARIABLE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 15:04:32

****
* SOIL PRESSURES FOR *
* ANCHORED WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<------NET------> (SOIL + WATER) ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
6.3	0.0	0.0	0.0	141.5	141.5	4179.1
5.3	0.0	0.0	0.0	167.5	167.5	4945.3
4.3	0.0	0.0	0.0	193.4	193.4	5711.5

Anchored_Deadman

3.3	0.0	0.0	0.0	219.3	219.3	6477.6
2.3	0.0	0.0	0.0	245.3	245.3	7243.8
2.0	0.0	0.0	0.0	253.1	253.1	7473.7
1.3	43.7	0.0	0.0	305.4	261.7	7730.1
0.3	106.1	0.0	0.0	380.2	274.2	8096.5
0.0	124.8	0.0	0.0	402.7	277.9	8206.4
-0.7	124.8	0.0	0.0	411.4	286.6	8462.9
-1.7	124.8	0.0	0.0	423.8	299.0	8829.2
-2.7	124.8	0.0	0.0	436.2	311.4	9195.6
-3.6+	124.8	0.0	0.0	447.3	322.5	9525.3
-3.6-	124.8	0.0	0.0	487.5	362.7	7472.2
-3.7	124.8	0.0	0.0	488.8	364.0	7498.2
-4.7	124.8	0.0	0.0	501.4	376.6	7758.3
-5.7	124.8	0.0	0.0	514.0	389.2	8018.4
-6.7	124.8	0.0	0.0	526.6	401.8	8278.4
-7.7	124.8	0.0	0.0	539.3	414.5	8538.5
-8.7	124.8	0.0	0.0	551.9	427.1	8798.6
-9.7	124.8	0.0	0.0	564.5	439.7	9058.7
-10.7	124.8	0.0	0.0	577.1	452.3	9318.8
-11.7	124.8	0.0	0.0	589.8	465.0	9578.8
-12.7	124.8	0.0	0.0	602.4	477.6	9838.9
-13.7	124.8	0.0	0.0	615.0	490.2	10099.0
-14.7	124.8	0.0	0.0	627.6	502.8	10359.1
-15.7	124.8	0.0	0.0	640.3	515.5	10619.2
-16.0	124.8	0.0	0.0	644.1	519.3	10697.2
-16.7	124.8	182.1	8.8	470.8	528.1	10879.2
-17.0	124.8	260.1	12.6	396.6	531.9	10957.3
-17.7	124.8	442.1	21.5	223.4	540.7	11139.3
-18.6	124.8	676.9	32.9	0.0	552.1	11374.1
-18.7	124.8	702.2	34.1	-24.1	553.3	11399.4
-19.7	124.8	962.3	46.7	-271.5	566.0	11659.5
-20.7	124.8	1222.4	59.3	-519.0	578.6	11919.6
-21.7	124.8	1482.5	72.0	-766.4	591.2	12179.6
-22.2+	124.8	1612.5	78.3	-12530.2	597.5	12309.7
-22.2-	124.8	24295.1	0.0	-12530.2	0.0	26252.9
-22.7	124.8	24326.4	0.0	-24201.6	0.0	26284.2
-23.7	124.8	24389.0	0.0	-24264.2	0.0	26346.8
-24.7	124.8	24451.6	0.0	-24326.8	0.0	26409.4
-25.7	124.8	24514.2	0.0	-24389.4	0.0	26472.0
-26.7	124.8	24576.8	0.0	-24452.0	0.0	26534.6
-27.7	124.8	24639.4	0.0	-24514.6	0.0	26597.2
-28.7	124.8	24702.0	0.0	-24577.2	0.0	26659.8
-29.7	124.8	24764.6	0.0	-24639.8	0.0	26722.4
-30.7	124.8	24827.2	0.0	-24702.4	0.0	26785.0
-31.7	124.8	24889.8	0.0	-24765.0	0.0	26847.6
-32.7	124.8	24952.4	0.0	-24827.6	0.0	26910.2
-33.7	124.8	25015.0	0.0	-24890.2	0.0	26972.8
-34.7	124.8	25077.6	0.0	-24952.8	0.0	27035.4
-35.7	124.8	25140.2	0.0	-25015.4	0.0	27098.0
-36.7	124.8	25202.8	0.0	-25078.0	0.0	27160.6
-37.7	124.8	25265.4	0.0	-25140.6	0.0	27223.2
-38.7	124.8	25328.0	0.0	-25203.2	0.0	27285.8
-39.7	124.8	25390.6	0.0	-25265.8	0.0	27348.4
-40.7	124.8	25453.2	0.0	-25328.4	0.0	27411.0
-41.7	124.8	25515.8	0.0	-25391.0	0.0	27473.6
-42.7	124.8	25578.4	0.0	-25453.6	0.0	27536.2
-43.7	124.8	25641.0	0.0	-25516.2	0.0	27598.8
-44.7	124.8	25703.6	0.0	-25578.8	0.0	27661.4
-45.7	124.8	25766.2	0.0	-25641.4	0.0	27724.0
-46.7	124.8	25828.8	0.0	-25704.0	0.0	27786.6
-47.7	124.8	25891.4	0.0	-25766.6	0.0	27849.2
-48.7	124.8	25954.0	0.0	-25829.2	0.0	27911.8
-49.7	124.8	26016.6	0.0	-25891.8	0.0	27974.4

Anchored_Deadman

-50.7	124.8	26079.2	0.0	-25954.4	0.0	28037.0
-51.7	124.8	26141.8	0.0	-26017.0	0.0	28099.6
-52.7	124.8	26204.4	0.0	-26079.6	0.0	28162.2
-53.7	124.8	26267.0	0.0	-26142.2	0.0	28224.8
-54.7	124.8	26329.6	0.0	-26204.8	0.0	28287.4
-55.7	124.8	26392.2	0.0	-26267.4	0.0	28350.0
-56.7	124.8	26454.8	0.0	-26330.0	0.0	28412.6
-57.7	124.8	26517.4	0.0	-26392.6	0.0	28475.2
-58.7	124.8	26580.0	0.0	-26455.2	0.0	28537.8
-59.7	124.8	26642.6	0.0	-26517.8	0.0	28600.4
-60.7	124.8	26705.2	0.0	-26580.4	0.0	28663.0
-61.7	124.8	26767.8	0.0	-26643.0	0.0	28725.6
-62.7	124.8	26830.4	0.0	-26705.6	0.0	28788.2
-63.7	124.8	26893.0	0.0	-26768.2	0.0	28850.8
-64.7	124.8	26955.6	0.0	-26830.8	0.0	28913.4
-65.7	124.8	27018.2	0.0	-26893.4	0.0	28976.0
-66.7	124.8	27080.8	0.0	-26956.0	0.0	29038.6
-67.7	124.8	27143.4	0.0	-27018.6	0.0	29101.2
-68.7	124.8	27206.0	0.0	-27081.2	0.0	29163.8
-69.7	124.8	27268.6	0.0	-27143.8	0.0	29226.4
-70.7	124.8	27331.2	0.0	-27206.4	0.0	29289.0
-71.7	124.8	27393.8	0.0	-27269.0	0.0	29351.6
-72.7	124.8	27456.4	0.0	-27331.6	0.0	29414.2
-73.7	124.8	27519.0	0.0	-27394.2	0.0	29476.8
-74.7	124.8	27581.6	0.0	-27456.8	0.0	29539.4
-75.7	124.8	27644.2	0.0	-27519.4	0.0	29602.0
-76.7	124.8	27706.8	0.0	-27582.0	0.0	29664.6
-77.7	124.8	27769.4	0.0	-27644.6	0.0	29727.2
-78.7	124.8	27832.0	0.0	-27707.2	0.0	29789.8
-79.7	124.8	27894.6	0.0	-27769.8	0.0	29852.4
-80.7	124.8	27957.2	0.0	-27832.4	0.0	29915.0
-81.7	124.8	28019.8	0.0	-27895.0	0.0	29977.6
-82.7	124.8	28082.4	0.0	-27957.6	0.0	30040.2
-83.7	124.8	28145.0	0.0	-28020.2	0.0	30102.8

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 18-AUGUST-2010 TIME: 15:04:33

****
* SUMMARY OF RESULTS FOR *
* ANCHORED WALL DESIGN *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS

AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

METHOD	:	FREE EARTH	FIXED EARTH
WALL BOTTOM ELEVATION (FT)	:	-22.20	-23.89
PENETRATION (FT)	:	6.20	7.89
MAXIMUM BENDING MOMENT (LB-FT)	:	-3.5110E+04	2.8184E+04
AT ELEVATION (FT)	:	-10.03	-22.28
MAXIMUM SCALED DEFLECTION (LB-IN^3)	:	3.5767E+09	1.8556E+09
AT ELEVATION (FT)	:	-9.70	-8.70
ANCHOR FORCE (LB)	:	6.4282E+03	5.2655E+03

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 18-AUGUST-2010 TIME: 15:04:33

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL DESIGN *
* BY FREE EARTH METHOD *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--RESULTS (ANCHOR FORCE= 6428. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
6.30	0.0000E+00	0.	-1.9906E+09	141.51
5.30	7.5077E+01	154.	-1.5286E+09	167.45
4.30	3.1760E+02	335.	-1.0664E+09	193.39
3.30	7.5353E+02	541.	-6.0370E+08	219.34
2.30	1.4088E+03	774.	-1.3964E+08	245.28
2.00	1.6520E+03	848.	0.0000E+00	253.06
2.00	1.6520E+03	-5580.	0.0000E+00	253.06
1.30	-2.1876E+03	-5384.	3.2626E+08	305.43
0.30	-7.4069E+03	-5042.	7.8837E+08	380.23
0.00	-8.9019E+03	-4924.	9.2491E+08	402.67
-0.70	-1.2249E+04	-4639.	1.2377E+09	411.36
-1.70	-1.6681E+04	-4222.	1.6660E+09	423.76
-2.70	-2.0689E+04	-3792.	2.0655E+09	436.17
-3.60	-2.3923E+04	-3394.	2.3947E+09	447.33
-3.60	-2.3923E+04	-3394.	2.3947E+09	487.51
-3.70	-2.4260E+04	-3345.	2.4293E+09	488.78
-4.70	-2.7359E+04	-2850.	2.7512E+09	501.40
-5.70	-2.9956E+04	-2343.	3.0260E+09	514.03
-6.70	-3.2040E+04	-1822.	3.2490E+09	526.65
-7.70	-3.3596E+04	-1289.	3.4168E+09	539.27

-8.70	-3.4614E+04	-744.	3.5266E+09	551.90
-9.70	-3.5080E+04	-185.	3.5767E+09	564.52
-10.70	-3.4981E+04	385.	3.5662E+09	577.15
-11.70	-3.4305E+04	969.	3.4953E+09	589.77
-12.70	-3.3039E+04	1565.	3.3653E+09	602.40
-13.70	-3.1170E+04	2174.	3.1783E+09	615.02
-14.70	-2.8687E+04	2795.	2.9375E+09	627.65
-15.70	-2.5576E+04	3429.	2.6472E+09	640.27
-16.00	-2.4519E+04	3622.	2.5512E+09	644.06
-16.70	-2.1840E+04	4012.	2.3128E+09	470.84
-17.00	-2.0616E+04	4142.	2.2048E+09	396.60
-17.70	-1.7634E+04	4359.	1.9407E+09	223.39
-18.60	-1.3638E+04	4460.	1.5785E+09	0.00
-18.70	-1.3204E+04	4459.	1.5382E+09	-24.07
-19.70	-8.7992E+03	4311.	1.1129E+09	-271.53
-20.70	-4.6654E+03	3916.	6.7229E+08	-518.98
-21.70	-1.0506E+03	3273.	2.2358E+08	-766.44
-22.20	0.0000E+00	0.	0.0000E+00	-12433.56

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<----------SOIL PRESSURES---------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
6.30	0.	0.	0.	142.	4179.
5.30	0.	0.	0.	167.	4945.
4.30	0.	0.	0.	193.	5711.
3.30	0.	0.	0.	219.	6478.
2.30	0.	0.	0.	245.	7244.
2.00	0.	0.	0.	253.	7474.
1.30	44.	0.	0.	262.	7730.
0.30	106.	0.	0.	274.	8096.
0.00	125.	0.	0.	278.	8206.
-0.70	125.	0.	0.	287.	8463.
-1.70	125.	0.	0.	299.	8829.
-2.70	125.	0.	0.	311.	9196.
-3.60+	125.	0.	0.	323.	9525.
-3.60+	125.	0.	0.	363.	7472.
-3.70	125.	0.	0.	364.	7498.
-4.70	125.	0.	0.	377.	7758.
-5.70	125.	0.	0.	389.	8018.
-6.70	125.	0.	0.	402.	8278.
-7.70	125.	0.	0.	414.	8539.
-8.70	125.	0.	0.	427.	8799.
-9.70	125.	0.	0.	440.	9059.
-10.70	125.	0.	0.	452.	9319.
-11.70	125.	0.	0.	465.	9579.
-12.70	125.	0.	0.	478.	9839.
-13.70	125.	0.	0.	490.	10099.
-14.70	125.	0.	0.	503.	10359.
-15.70	125.	0.	0.	515.	10619.
-16.00	125.	0.	0.	519.	10697.
-16.70	125.	182.	9.	528.	10879.
-17.00	125.	260.	13.	532.	10957.
-17.70	125.	442.	21.	541.	11139.
-18.60	125.	677.	33.	552.	11374.
-18.70	125.	702.	34.	553.	11399.

Anchored_Deadman

-19.70	125.	962.	47.	566.	11659.
-20.70	125.	1222.	59.	579.	11920.
-21.70	125.	1482.	72.	591.	12180.
-22.20+	125.	1612.	78.	598.	12310.
-22.20+	125.	24295.	0.	0.	26253.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 18-AUGUST-2010 TIME: 15:04:33

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL DESIGN *
* BY FIXED EARTH METHOD *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--RESULTS (ANCHOR FORCE= 5266. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
6.30	0.0000E+00	0.	-1.1542E+09	141.51
5.30	7.5077E+01	154.	-8.8670E+08	167.45
4.30	3.1760E+02	335.	-6.1906E+08	193.39
3.30	7.5353E+02	541.	-3.5084E+08	219.34
2.30	1.4088E+03	774.	-8.1285E+07	245.28
2.00	1.6520E+03	848.	0.0000E+00	253.06
2.00	1.6520E+03	-4417.	0.0000E+00	253.06
1.30	-1.3738E+03	-4222.	1.9022E+08	305.43
0.30	-5.4303E+03	-3879.	4.5935E+08	380.23
0.00	-6.5765E+03	-3761.	5.3857E+08	402.67
-0.70	-9.1102E+03	-3477.	7.1916E+08	411.36
-1.70	-1.2379E+04	-3059.	9.6328E+08	423.76
-2.70	-1.5224E+04	-2629.	1.1861E+09	436.17
-3.60	-1.7412E+04	-2231.	1.3643E+09	447.33
-3.60	-1.7412E+04	-2231.	1.3643E+09	487.51
-3.70	-1.7633E+04	-2183.	1.3826E+09	488.78
-4.70	-1.9569E+04	-1688.	1.5488E+09	501.40
-5.70	-2.1004E+04	-1180.	1.6812E+09	514.03
-6.70	-2.1924E+04	-660.	1.7773E+09	526.65
-7.70	-2.2319E+04	-127.	1.8357E+09	539.27
-8.70	-2.2173E+04	419.	1.8556E+09	551.90
-9.70	-2.1476E+04	977.	1.8372E+09	564.52
-10.70	-2.0215E+04	1548.	1.7819E+09	577.15
-11.70	-1.8376E+04	2132.	1.6916E+09	589.77
-12.70	-1.5947E+04	2728.	1.5697E+09	602.40
-13.70	-1.2916E+04	3336.	1.4204E+09	615.02
-14.70	-9.2704E+03	3958.	1.2488E+09	627.65
-15.70	-4.9968E+03	4592.	1.0612E+09	640.27
-16.00	-3.5904E+03	4784.	1.0030E+09	644.06
-16.70	-9.7778E+01	5175.	8.6517E+08	470.84
-17.00	1.4746E+03	5305.	8.0592E+08	396.60
-17.70	5.2709E+03	5522.	6.6900E+08	223.39
-18.60	1.0316E+04	5622.	4.9949E+08	0.00
-18.70	1.0863E+04	5621.	4.8197E+08	-24.07

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-19.70	1.6431E+04	5473.	3.1370E+08	-271.53
-20.70	2.1727E+04	5078.	1.7379E+08	-518.98
-21.70	2.6505E+04	4436.	7.1353E+07	-766.44
-22.20	2.8137E+04	1111.	3.6789E+07	-12530.24
-22.70	2.6640E+04	-8072.	1.4268E+07	-24201.62
-23.70	6.4570E+03	-32305.	6.6998E+04	-24264.22
-24.70	0.0000E+00	-36838.	0.0000E+00	-24275.91

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<----------SOIL PRESSURES---------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
6.30	0.	0.	0.	142.	4179.
5.30	0.	0.	0.	167.	4945.
4.30	0.	0.	0.	193.	5711.
3.30	0.	0.	0.	219.	6478.
2.30	0.	0.	0.	245.	7244.
2.00	0.	0.	0.	253.	7474.
1.30	44.	0.	0.	262.	7730.
0.30	106.	0.	0.	274.	8096.
0.00	125.	0.	0.	278.	8206.
-0.70	125.	0.	0.	287.	8463.
-1.70	125.	0.	0.	299.	8829.
-2.70	125.	0.	0.	311.	9196.
-3.60+	125.	0.	0.	323.	9525.
-3.60+	125.	0.	0.	363.	7472.
-3.70	125.	0.	0.	364.	7498.
-4.70	125.	0.	0.	377.	7758.
-5.70	125.	0.	0.	389.	8018.
-6.70	125.	0.	0.	402.	8278.
-7.70	125.	0.	0.	414.	8539.
-8.70	125.	0.	0.	427.	8799.
-9.70	125.	0.	0.	440.	9059.
-10.70	125.	0.	0.	452.	9319.
-11.70	125.	0.	0.	465.	9579.
-12.70	125.	0.	0.	478.	9839.
-13.70	125.	0.	0.	490.	10099.
-14.70	125.	0.	0.	503.	10359.
-15.70	125.	0.	0.	515.	10619.
-16.00	125.	0.	0.	519.	10697.
-16.70	125.	182.	9.	528.	10879.
-17.00	125.	260.	13.	532.	10957.
-17.70	125.	442.	21.	541.	11139.
-18.60	125.	677.	33.	552.	11374.
-18.70	125.	702.	34.	553.	11399.
-19.70	125.	962.	47.	566.	11659.
-20.70	125.	1222.	59.	579.	11920.
-21.70	125.	1482.	72.	591.	12180.
-22.20+	125.	1612.	78.	598.	12310.
-22.20+	125.	24295.	0.	0.	26253.
-22.70	125.	24326.	0.	0.	26284.
-23.70	125.	24389.	0.	0.	26347.
-24.70	125.	24452.	0.	0.	26409.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 18-AUGUST-2010 TIME: 15:04:41

****
* PRELIMINARY DESIGN DATA FOR *
* FREE EARTH DESIGN IN SAND *
****

I.--HEADING
'KEY WEST NAVAL AIR STATION (BREAKWATER 497)
'TRUMAN ANNEX, KEY WEST, FLORIDA

II.--DESIGN PARAMETERS

WALL HEIGHT RATIO (ALPHA) = 0.78
ANCHOR HEIGHT RATIO (BETA) = 0.15

SHEET PILE DATA:

SHEET PILE NAME	<SECTION PROPERTIES> (PER FOOT OF WALL) SECTION MODULUS (IN^3)	MOMENT OF INERTIA (IN^4)	ALLOWABLE STRESS (PSI)	MODULUS OF ELASTICITY (PSI)
PZ40	60.70	490.80	2.40E+04	2.90E+07
PZ38	46.80	280.80	2.40E+04	2.90E+07
PZ35	48.50	361.20	2.40E+04	2.90E+07
PZ32	38.30	220.40	2.40E+04	2.90E+07
PZ27	30.20	184.20	2.40E+04	2.90E+07
PZ22	18.10	84.40	2.40E+04	2.90E+07
PLZ25	32.80	223.25	2.40E+04	2.90E+07
PLZ23	30.20	203.75	2.40E+04	2.90E+07

III.--PRELIMINARY DESIGN DATA

SHEET PILE NAME	LOG(H^4/EI)	ROWE'S MOMENT REDUCTION COEF. LOOSE	ROWE'S MOMENT REDUCTION COEF. DENSE	RATIO OF ALLOWABLE MOMENT TO REDUCED FREE EARTH MOMENT LOOSE	RATIO OF ALLOWABLE MOMENT TO REDUCED FREE EARTH MOMENT DENSE
PZ40	-4.33	1.00*	1.00*	3.46	3.46
PZ38	-4.09	1.00*	1.00*	2.67	2.67
PZ35	-4.20	1.00*	1.00*	2.76	2.76
PZ32	-3.99	1.00*	1.00*	2.18	2.18
PZ27	-3.91	1.00*	1.00*	1.72	1.72
PZ22	-3.57	1.00*	1.00*	1.03	1.03
PLZ25	-3.99	1.00*	1.00*	1.87	1.87
PLZ23	-3.95	1.00*	1.00*	1.72	1.72

* REDUCTION NOT APPLICABLE DUE TO
LOG(H^4/EI) LESS THAN -3.5 OR GREATER THEN -1.5.

NOTE TO BIDDER: Use preferably BLACK ink for completing this Bid form.

BID FORM

To: The City of Key West

Address: 3140 Flagler Ave, Key West, Florida 33040

Project Title: REPAIRS TO BULKHEAD 497 US NAVY MOLE

City of Key West Project No.: ITB NUMBER 12-007

Bidder's person to contact for additional information on this Bid:

Name: _____

Telephone: _____

BIDDER'S DECLARATION AND UNDERSTANDING

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Bid are those named herein, that this Bid is, in all respects, fair and without fraud, that it is made without collusion with any official of the Owner, and that the Bid is made without any connection or collusion with any person submitting another Bid on this Contract.

The Bidder further declares that he has carefully examined the Contract Documents for the construction of the project, that he has personally inspected the site, that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the Work and to identify the said quantities with the detailed requirements of the Contract Documents, and that this Bid is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Bid.

The Bidder further agrees, as evidenced by signing the Bid, that if awarded a Contract, the Florida Trench Safety Act and applicable trench safety standards will be complied with.

CONTRACT EXECUTION AND BONDS

The Bidder agrees that if this Bid is accepted, he will, within 10 days, not including Sundays and legal holidays, after Notice of Award, sign the Contract in the form annexed hereto, and will at that time, deliver to the Owner examples of the Performance Bond and Payment Bond required herein, and evidence of holding required licenses and certificates, and will, to the extent of his Bid, furnish all machinery, tools, apparatus, and other means of construction and do the Work and furnish all the materials necessary to complete all work as specified or indicated in the Contract Documents.

CERTIFICATES OF INSURANCE

Bidder agrees to furnish the Owner, before commencing the Work under this Contract, the certificates of insurance as specified in these Documents.

START OF CONSTRUCTION AND CONTRACT COMPLETION TIMES

The Bidder agrees to begin work within 10 calendar days after the date of the Notice to Proceed and to achieve Substantial Completion within 270 calendar days from the date when the Contract Times commence to run as provided in paragraph 2.03.A of the General Conditions, and Work will be completed and ready for final payment and acceptance in accordance with paragraph 14.07 of the General Conditions within 270 calendar days from the date when the Contract Times commence to run.

LIQUIDATED DAMAGES

In the event the Bidder is awarded the Contract, Owner and Bidder recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph Start of Construction and Contract Completion Times above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. Owner and Bidder also recognize the delays, expense, and difficulties involved in proving in a legal or other dispute resolution preceding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Bidder agree that as liquidated damages for delay (but not as a penalty) Bidder shall pay Owner $400 per day for each day that expires after the time specified for substantial completion.

After Substantial Completion, if Bidder neglects, refuses, or fails to complete the remaining Work within the Contract Times or any Owner-granted extension thereof, Bidder shall pay Owner $400 for each day that expires after the time specified in paragraph Start of Construction and Contract Completion Times, above for completion and readiness for final payment. Liquidated damages shall run concurrent.

Owner will recover such liquidated damages by deducting the amount owed from the final payment or any retainage held by Owner.

ADDENDA

The Bidder hereby acknowledges that he has received Addenda Nos. _____, _____, ____, _____, ____, (Bidder shall insert No. of each Addendum received) and agrees that all addenda issued are hereby made part of the Contract Documents, and the Bidder further agrees that his Bid(s) includes all impacts resulting from said addenda.

SALES AND USE TAXES

The Bidder agrees that all federal, state, and local sales and use taxes are included in the stated Bid Prices for the Work. Cash allowances DO NOT include any sales and use tax. Equipment allowance includes taxes as shown in Equipment Suppliers' Bid.

PUBLIC ENTITY CRIMES

"A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods

or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list."

COMBINED UNIT PRICE AND LUMP SUM WORK

The Bidder further proposes to accept as full payment for the Work proposed herein the amounts computed under the provisions of the Contract Documents. For unit price bid items, the estimate of quantities of work to be done is tabulated in the Proposal and, although stated with as much accuracy as possible, is approximate only and is assumed solely for the basis of calculation upon which the award of Contract shall be made. For lump sum bid items, it is expressly understood that the amounts are independent of the exact quantities involved. The Bidder agrees that the amounts for both unit price and lump sum work represent a true measure of labor and materials required to perform the Work, including all allowances for inspection, testing, overhead and profit for each type of work called for in these Contract Documents. The amounts shall be shown in both words and figures. In case of discrepancy, the amount shown in words shall govern.

DEWATERING PERMIT

Bidder further acknowledges that they maybe required to obtain a dewatering permit as required by the South Florida Water Management District (SFWMD). Bidder acknowledges that the City will pay the actual costs of the permit(s) as charged by the South Florida Water Management District. The contractor shall estimate his cost in assembling the permit application and submit it in the bid.

Bidder will complete the Work in accordance with the Contract Documents for a fixed fee price.

LUMP SUM BID PRICE (Contractor shall verify quantities)

Item Description		Quantity	Unit	Unit Price	Cost
Permits (actual Costs to be paid by the City)					
	Dewatering Permit SFWMD Allowance	1	EA		
Substructure					
	Encasement (concrete cap)		CY		
	Demolition of Encasement		CY		
	Rebar		LB		
	Install dowels		EA		
	Coating		SF		
	Install steel sheet pile		SF		
	Sheet pile shoes		EA		
	Rock Anchor Wale		LF		
	Drill through existing steel sheet pile		EA		
	Install rock Anchors		EA		
	Install Flowable Fill Material		CY		
Supersturcture					
	Replace Frames and Covers		EA		
Deck Components					
	Install Concrete Apron		CY		
	Install Bituminous pavement		TN		
	Excavation/Backfill		CY		
Electrical Utilities					
	Electrical	1	LS		
	Telecommunications/Security	1	LS		
Other					
	Mobilization/Demobilization	1	LS		
Costs Associated with implementation of the Cruise Ship Docking Plan		1	LS		

Base Bid _____

Addendum 2 Paving (alternate Bid Item)					
	Area 2	159,573	SF		
	Area 3	18,216	SF		
	Area 4	24,134	SF		

Alternate Bid Item Addendum 2 _____

Total _____

TOTAL BASE BID ITEM PLUS ALTERNATE BID ITEM:

_____Dollars

(Amount written in words has precedence)

and _____Cents

TOTAL BASE BID ITEM PLUS ALTERNATE BID ITEM $_____

(numerals)

The City reserves the right to award to the Base Bid only or Base Bid plus Alternate Bid Item (Paving).

SUBCONTRACTORS

The Bidder further proposes that the following subcontracting firms or businesses will be awarded subcontracts for the following portions of the Work in the event that the Bidder is awarded the Contract:

_____

Name

_____ _____ _____

Street City State Zip

_____

Name

_____ _____ _____

Street City State Zip

_____

Name

_____ _____ _____

Street City State Zip

_____

Name

_____ _____ _____

Street City State Zip

Surety

_____ whose address is

_____ _____ _____

Street City State Zip

Bidder

The name of the Bidder submitting this Bid is _____

_____ doing business at

_____ _____ _____

Street City State Zip

which is the address to which all communications concerned with this Bid and with the Contract shall be sent.

The names of the principal officers of the corporation submitting this Bid, or of the partnership, or of all persons interested in this Bid as principals are as follows:

_____ _____

_____ _____

_____ _____

If Sole Proprietor or Partnership

IN WITNESS hereto the undersigned has set his (its) hand this ___ day of _____ 20___.

_____

Signature of Bidder

_____

Title

If Corporation

IN WITNESS WHEREOF the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers this ___ day of 20___.

(SEAL)

_____
Name of Corporation

By: _____

Title: _____

Attest: _____
Secretary

END OF SECTION

RESPONSE TO CONTRACTOR
REQUEST FOR INFORMATION (RFI)

1. Are there any loading restrictions on the existing mole pier or minimum setback requirements? Will Construction equipment, such as a crawler crane weighing 40tons be allowed to drive and work on the center MOLE project site

Response:
The original capacity for the structure is 600 psf uniform live load and HS-20 truck loading. The area of bulkhead under repair will clearly have a lower capacity and per note 2 on sheet C-101, it is up to the Contractor to assess the suitability of the existing bulkhead to support intended construction loads. Additionally, any cranes or other construction equipment must comply with note 6 on sheet C-101 which states the Contractor shall ensure that at all times a minimum of a 20 ft travel lane exist between the work site and any obstructions on the Central Mole to allow safe passage of vehicles.

2. Plan Sheet C-101, Note 4 states that the northern most bollard must be kept available for visiting ships. However, Sheet C-901, Note 2 indicates that visiting ships require use of all bollards. Please clarify

Response:
All bollards in the construction site are normally used by visiting cruise ships. Contractor shall address in their Cruise Ship Docking Plan how accessibility to all bollards will be maintained during a schedule docking operation.

.3. Plan Sheet C-101, Note 9 indicates that existing timber piles are to be removed in their entirety. What is embedded length of fender piles? Will the contractor be expected to excavate if piles break below mudline during extraction?

Response:
Reason for removal of remnant timber piles was so sheet pile driving operations would not be impacted.

4. The bid pricing sheet has Demobilization/Site Prep under the heading of "In-Water or overwater Demolition". Should this line item only apply to activities for demolition or include demobilization and site prep for whole job?

Response:
See revised Bid Sheet

5. Should mobilization be spread through all bid items?

Response:
See revised Bid Sheet

6. Should rebar for concrete deck be included under Substructure or Install Concrete Apron?

Response: Rebar for the apron should be included in Install Concrete Apron

7. If an obstruction or other impediment causes the relocation of an anchor, how much variance (horizontally or vertically) from the specified location is allowed before a redesign must be performed?

Response
Revised specification Section 31 68 13, part 3.1.7.1 changes tolerances from 3 in to 1 ft in the horizontal location of the rock anchors. If an obstruction or other impediment prevents placement of the anchor within the specified tolerances, then it would be considered an unforeseen site condition.

8. Is a Geotech report available for this project?

Response:
The Geotech Report is available and is a part of this Addendum

9. Can a 30 work day “Hot Work” permit be available for welding and steel cutting, as to eliminate the process of renewing one every day.

Response:
Contractor shall apply for a Hot Work Permit with the NAS Fire Department. Burn permits are typically issued for a week duration at a time.

10. Will the final authority for project approvals, coordination’s or conflicts the City of Key West, the US Navy, USACE or other entity?

Response
The Contract Specifications includes a Submittal Register. Approving authority indicated with a “G” will be approved by the city with the concurrence of the Navy. A number of items require approval by the A/E.

11. Is the funding for this project already appropriated and approved or is there a process after the bid?

Response
Funding for this project has been earmarked. Final award of the contract will require approval by City Commission

12. Noted on page 5-1.6.1.1 (SSHO) states the QC and SSHO can be the same person. Will that person be required to be on the worksite at all times?

Response:
QC shall be on site at all times. SSHO is required on site during hazardous activities

13. Will barges and support boats be able to operate freely around the site during work times, or will they face unusual restrictions due to the larger traffic?

Response:
No unusual restrictions apply in this area. Contractor is to be aware that the project site is adjacent to a Shipping Channel.

14. Will barges be required to be ABS load line certified?

Response:
The City does not require barges to have ABS load line certification

15. Is there adequate mooring space available for barges and marine equipment?

Response:
Mooring on the inside face of the mole pier will be made available to the contractor but must be requested.

16. Will contractors be permitted to spud barges overnight at the jobsite?

Response:
The City/Navy will allow spud barges to overnight at the jobsite so long as shipping traffic in the adjacent channel is not affected and scheduled cruise ships are able to dock.

17. What is the anticipated start date?

Response:
Award is anticipated in May 2012

18. If in the process of uncovering the existing utilities, conduits, raceways and manholes we discover code violations and required upgrades to meet current codes, who will be responsible for the costs?

Response;
Discovery of code violations may be considered an unforeseen site condition, but that does not automatically warrant a change order.

19. Is there a designated location for an office trailer and temporary facilities near the worksite?

RESPONSE TO CONTRACTOR
REQUEST FOR INFORMATION (RFI)

Response:
A location for an office trailer will be identified on the project site with power. No water or sewer will be available.

20. Will any special crane permits be required for our land and barge cranes?

Response:
The city requires cranes to have permits as required by the State of Florida

21. Will there be any provisions for designated construction employee parking near the job site?

Response:
Private vehicles will be required to park off outside the Navy Gate. Company vehicles will be permitted to enter Navy property. Parking is limited

22. Will here be any provision for adjustment of the project duration due to the likely event of unscheduled ships mooring in a location hampering the construction work?

Response:
The Project duration will be adjusted for unscheduled ship mooring.

23. On the bid schedule, there is one item called “Sheet Pile Shoes”, is this same thing on the drawing called “S24x80 Wale” on the top of sheet pile?

Response:
No. The steel sheet pile shoes are located at the tips of the sheet piling to prevent damage during pile driving.

24. Approved night work may be the best possible scenario for accomplishing the work in the least obtrusive fashion for the City of Key West. Realizing that night work has to be pre-approved, is there a way to get a verdict either for or against night work before bid date?

Response:
The City will approve night work. Contractors shall submit in advance their schedule for night work which list activities and inspections required. Contractor shall also be aware of the City’s Noise Ordinance which is as follows:

> *Construction/demolition.* Sound levels produced from tools and equipment in commercial construction, demolition, drilling, or reasonably similar activities. However, such sound levels are

limited to the hours of 8:00 a.m. to 7:00 p.m., Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturday. The tools and equipment must be muffled and maintained equal to the functional standards of the industry. No exceptions contained in this subsection shall apply on Thanksgiving Day, Christmas Day and New Year's Day.

Waivers to this ordinance may be requested but require City Commission approval.

25. Please provide the specs for flowable fill material.

Response
Refer to Specification 31 00 00, section 2.1.1.1b for flowable fill requirements.

26. Can we use excavated material for backfill?

Response:
Refer to Specification 31 00 00, section 1.5.1 and 2.1.1.1 for backfill requirements.

27. If an obstruction or other impediment causes the relocation of an anchor, how much variance (horizontally or vertically) from the specified location is allowed before a redesign must be performed?

Refer to response for question #7.

28. If an obstruction or other impediment causes the relocation of an anchor, we would accrue additional costs. Would a cost per linear foot for additional drilling, grouting and rock anchors be acceptable for accounting for additional quantities. Also, should we have a per unit cost for cutting through the existing sheet pilings in case we have to relocate an anchor?

Response:
If an obstruction or other impediment can be overcome within the tolerances specified in revised Specification 31 68 13, section 3.1.7.1, then this is not considered an unforeseen site condition and no change order will be issued. If the obstruction or impediment cannot be overcome within the tolerances specified in revised Specification 31 68 13, section 3.1.7.1, then this will be considered an unforeseen site condition.

29. Notes 2 and 7 on sheet E-101 calls for conductors to be removed and replaced. How many conductors are involved in each location?

Response:
Assume up to 25 conductors per location.

30. Are the anchors to be installed at 51 or 39 degrees below the horizontal? There is a conflict between the specs and the drawings?

Response
Anchors are to be installed at 39 degrees (1 on 0.8 slope) from the horizontal as shown in the drawings.

31. Do the soil anchor 1 3/8" dia. GR150 bars have to be epoxy coated inside the pregrouted corrugated encapsulation?

Response:
Yes. Corrosion protection shall be provided for the entire anchor. Refer to Specification 31 68 13, section 2.5.6 for corrosion protection requirements.

32. Are demonstration test anchors required?

Response:
Yes. Demonstration test anchors are required per Specification 31 69 13, section 3.4.1. Additionally, specifications call for all other rock anchors to be proof tested per section 3.4.3.

33. If watertightness testing and waterproofing of the anchor drill holes is required, then there needs to be unit price pay items for the following: setup watertightness test grout redrillingThese items are unpredictable and cannot be estimated by the contractor.

Response:
Watertightness testing is required per Specification 31 69 13, section 3.1.8. The Geotechnical Report included with the project documents indicates Rock Quality Designations varying from 0 to 45 based on 3 core samples indicating porous limestone. Contractor shall make assessment and judgment of watertightness (or lack of) based on available information and make accommodations in bid for anticipated results.

34. Are all environmental permit fees to be paid by the City of Key West?

Response:
The city will pay the actual permit fees as required by the issuing agency. Contractor shall include in their bid the costs to assemble documentation and process the permit(s).

36. On Sheet S-502: END DETAIL (located in the upper right corner of the page) it is noted that welding on both sides of the joint between the new and old sheet piles is called

out all the way to the mud line. Request that the A/E confirm that underwater welding is required and whether inspections of the weld will be necessary.. On other USACOE we have grouted these joints to the mud line and this met their requirements.

Response:
The weld is required to provide closure and to support form loads for the concrete seal at the North end of the repair area, however welding both sides of the closure plate is not required. Underwater inspection of the weld is necessary.

37. Cruise Ship Docking Calendar; On the City's website the Outter Mole/Bulkhead 497 is designated as "OM". Cruise ships docking at Piers "A" and "B" do not impact this project.

38. Unexploded Ordinance: Contractors shall be aware of the following

> If any MEC or MPPEH items are encountered, the following steps must be taken:
> a. For expended or unexpended small arms ammunition, note their description and location, notify the responsible Explosives Safety officer (ESO) and the project manager, and handle them in accordance with reference (c) and applicable environmental regulations.
> b. For items other than expended or unexpended small arms ammunition, stop all operations, notify the responsible ESO, project manager, and request an emergency response from the cognizant Explosive Ordnance Disposal detachment. Operations cannot resume until NOSSA has been contacted and has provided guidance regarding the need for an ESS for this project.